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The Outlook

Reprisals

AT the very beginning of the war the Prime Minister announced that "whatever be the lengths to which others may go, His Majesty's Government will never resort to the deliberate attack on women and children and other civilians for purposes of mere terrorism." He repeated those words last week, and there is no doubt that they satisfy the conscience of all but the most debased sections of British people. Even though German airmen may inflict horrible sufferings on some of our people, as they have upon the people of Poland, it would give the British people no satisfaction to slaughter and torture German women and children.

Having made that quite clear, we may point out that more must not be read into Mr. Chamberlain's words than what he actually said. If Germany starts a campaign of bombing Britain, we shall not reply merely with leaflets. The whole force of our bombers, and doubtless those of France likewise, will be let loose on legitimate targets in Germany. Our bombers will act as long-range artillery, and with a similar effect to bombardment by big guns. German Generals know well what the results of that can be. But the destruction of munition factories, of railway stations, of bridges, and of other means of communication, far from the battle front, would be a punishment from which the whole German people might well suffer. Inevitably it must happen that some bombs would miss their mark, as some shells do, and from them some civilians must suffer. That we shall regret, and we shall do our best to avoid it, but it cannot be entirely prevented.

If things ever come to that deplorable pass, and it will only be through German initiative if they do, the enemy population will get a shock which may even shake their blind faith in what the Nazi leaders tell them. They have been assured over and over again that Germany's air defences are so strong that no Allied bombers can penetrate them, and that therefore the German people are safe. We have never made the claim that our defences can keep out all raiders. Yet the Germans cannot really feel indifferent to the innumerable reconnaissance flights which our bombers have made far and wide over Germany. They would stop them if they could, but they are not able to do so. R.A.F. photographers have kept our High Command informed of what is happening in Germany, and our navigators are now familiar with the routes to many German centres. Once let the *Luftwaffe* provoke us into active bombing, and a very unpleasant awakening will come upon the deluded German people.

Air Defence in France

A STORY has been going round the Press of how British fighters stood by and patrolled overhead throughout the period of disembarkation by the Expeditionary Force in France and the subsequent move to the front, and suggesting that so vigilant was the watch maintained by the fighters that not one enemy aircraft succeeded in crossing the enemy positions and the lines of communication while the Army was moving up. This would suggest that during a very critical operation the local air defence was one hundred per cent. efficient. The man in the street could be excused if he argued from this that, when air defence could be made so absolutely proof against mishap when spread over a number of seaports on the French coast, and that without much or any help from anti-aircraft guns (which themselves had to be disembarked, except for what, if any, the French may have lent), then the defence of London can be made equally impregnable.

Such a conclusion would certainly be fallacious. The disembarkation of the B.E.F. without interference by the *Luftwaffe* is one of the most mysterious happenings of this very unusual war. Most certainly it shows great lack of enterprise on the part of the German air arm. One would have expected that during that period the

German reconnaissance machines would have kept the French ports under constant observation by day and by night. The landings did not all take place in the darkness, but one would have expected a liberal use of parachute flares, and certainly a really formidable effort by German bombers to interfere with the landings, even at a cost of considerable losses. Heavy blows struck against the B.E.F. would have done more for the German cause than any slaughter in London or Birmingham could do. In fact, before the war, many military authorities held that a landing within reach of a hostile bomber force was an impossible operation of war. It has, none the less, been carried out, and the reason is still a matter for speculation.

The danger to us is that we may think that because the *Luftwaffe* has once been incredibly remiss, it will remain equally unenterprising in the future. That would be "wishful thinking." Our only safe policy is to assume that our enemies will do their utmost.

Plain Engineering, but . . .

FROM the correspondence which has appeared in *Flight* recently, it seems obvious that it is fairly well agreed that very soon we shall have to face up to the problems of shaft transmission. There is less unanimity about the manner in which it should be used. Several arrangements are possible, such as tandem engines in the fuselage, with oppositely rotating airscrews in the nose; or tandem engines in the fuselage with right-angle shaft drive to outboard tractor or pusher airscrews on the wings. If pushers are used, the airscrew shafts themselves will have to be fairly long, and there will be an unpleasant overhang of shafting from the rear spar. There are designers who consider the shaft worth while, even in the single-engined type such as the new American Bell "Airacobra" or XP-39.

It is often argued, mostly by people who have not given the subject much thought, that the design of such shafting is plain, straightforward engineering. So it may be, but experiments made hitherto do not promise trouble-free development.

Possibly the explanation is that they were "before their time," but against that must be set the fact that the powers that had to be transmitted in those early examples were far lower than those we are now contemplating. We happen to know of one experimental machine built recently in which there was considerable trouble with the long airscrew shafts. Ultimately a coupling with the right "period" was produced, and the trouble of snapping shafts disappeared; but in spite of being plain engineering, the task took a long time.

Dive Fighters

IT was demonstrated in Spain that a strong fighter biplane could bring down much faster machines by gaining speed in a dive. This fact, which has been exploited to the full by the protagonists of light, low-powered fighters, does not justify the building of slow defensive machines, but it emphasises that, even in these days, diving ability is a great asset, for, although a typical fighter has at least 40 or 50 m.p.h. in hand over a contemporary "evasive" bomber, a high-flying defender capable of long, fast dives enjoys an extra advantage over the raider.

There is another reason for insistence on good diving qualities in the fighter; this was well brought out when the French adopted the Curtiss Hawk 75A. A Curtiss test pilot was asked to do one really fast demonstration dive (actually over 575 m.p.h. was attained) to satisfy the French observers that the Hawk could engage a dive-bomber after it had begun its dive.

Already there are indications that before long we shall see fighters fitted with diving brakes.

TEN YEARS BETWEEN: Below is the "400 m.p.h.-plus" Bell XP-39, or Airacobra, single-seater fighter which has a shaft drive from its centrally-mounted Allison engine. On left is the Westland fighter, built to an Air Ministry specification issued in 1930, which had a similar power plant installation. The Westland was armed with four machine guns; so is the Bell, though these only supplement a 37 mm. shell-gun. On the other hand Westlands installed the first gun of this bore on a single-seater fighter years ago. We are sure that the Bell Aircraft Corporation, which deserves great credit for having developed such a remarkable machine (it has been ordered in quantity by the U.S. Army Air Corps), will forgive us for pointing out these historical facts.

WAR in the AIR

Fights Over the North Sea: A French Success: Photographing Germany

A destroyer steaming at the rate of knots glimpsed through the window of a Saro London.

NOW that Britain is not publishing weather reports the German meteorologists must be having a very trying time. The private citizen often jeers at our weather forecasts because they do not tell him for certain if it will be safe for him to leave his umbrella at home to-day. But that is a matter of local forecasting, which is very different from the weather plotting which has to be studied before large-scale military operations can be undertaken. The meteorologist must be able to plot a large chart extending roughly from the Ural Mountains to half-way across the Atlantic if he is to know the relation of depressions and anti-cyclones, and on that chart most of the weather comes from the West.

The German meteorologist now finds half his chart blank, and that the most important half. However, during the great freeze last month our papers reported that trains were held up and that there was heavy snow over much of Great Britain, whereas there was only light snow lying in Germany. That must have told the Germans a lot about the lie of the depressions, etc., and accordingly they must have presumed that our fighter aeroplanes would be snow-bound and that, therefore, their raiders would for once have a safe passage as they attacked helpless merchantmen. Their presumption was correct, but they had not counted on the energy of the R.A.F. The aerodromes were cleared and the fighters took off. One squadron brought down three, and perhaps four, Heinkels within a week, and also did a number of hours of night flying.

In our last issue we briefly recorded that one raider was brought down near North Berwick on Friday, February 9, but there were other encounters that day. One Spitfire on patrol far out at sea chased a Heinkel right through a cloud bank, and the two machines exchanged fire when they emerged above it. The Spitfire was not hit, and the Heinkel disappeared once more into the shelter of clouds. About noon the same day a patrol of Hurricanes sighted two Heinkels off the North-East Coast, one flying to the North and the other to the West. The Hurricane pilot used his speed, and managed to get within range and fire bursts at first one and then the other before they reached the sanctuary of the clouds.

Riddling the Raiders

OFF Arbroath some fighters hunted off three Heinkels which were flying low over the water, and sent some bullets after them. Near Peterhead other fighters went to the help of a tanker which was being bombed. As the avengers approached, the raider, which was thought to be a Junkers bomber, climbed for all it was worth into the clouds. These various incidents show how large a part the clouds play in the *Luftwaffe's* campaign against merchant shipping off our coasts. It is dirty work, but the fact that the German pilots open their throttles and make for the clouds at the first glimpse of Hurricanes or Spitfires is no reflection on their courage; it is simply common-sense tactics. If the sky were clear they would not have the faintest hope of escaping destruction, and when clear weather returns the fishermen may expect a relief from the murderous assaults which they have so stoutly endured.

In connection with this campaign against the murderous raiders, it is pleasing to learn that the fighter squadron which was formed with the £100,000 gift from the Nizam of Hyderabad to the Royal Air Force has shot down its first enemy aircraft. It is the first of the newly formed fighter squadrons to win a scalp. Its victim was one of the three Heinkels brought down during raids on shipping on February 3. A souvenir of the combat in the form of a rubber boat is now housed in the squadron's rest room. The Heinkel crashed into the sea in Creswell Bay, Northumberland. Three of the crew took to their rubber boat, but high seas swept them overboard. Their bodies have been washed ashore. Pieces of wreckage from the Heinkel have strewn the seashore and the pilots of the victorious squadron have been given some of the bullet-riddled metal as souvenirs. One large piece is to be beaten into a shield and engraved with the squadron's crest.

Nearly all the Dominions as well as Great Britain are represented among the pilots. The Commanding Officer is a native of Woolwich. He led the attack on the Heinkel and gave the *coup de grace*. This officer joined an Auxiliary squadron when he left school is 1929 and a year later secured a short-service commission in the R.A.F. He was attached to a Fighter Squadron in 1931 and was for some time on service with the squadron in the Near East. On his return to England he became an instructor. At the end of 1938 he went into the Organisations Branch at the Air Ministry, where he remained until he was given his present command.

There was more raiding on Tuesday, February 13th. In the evening three Spitfires were patrolling at a great height off the Thames estuary. Just as daylight was fading they saw a Heinkel 111 a thousand feet above them. The Germans saw the fighters, too, and the pilot began a long twisting dive towards a patch of cloud far beneath him, trying by his manœuvres to throw the fighters off their aim. The Spitfires put their noses down, each in turn

French fighters: The orderly line-up on the left is composed of Morane MS 406 fighters with Hispano Suiza 12 Y *moteur canon* (20 mm.) and two rifle-bore Chatellerant machine guns. Below are Curtiss Hawk 75 A.s (Twin Wasp); the latest version of this machine has six Brownings.

opening fire as the jinking Heinkel came in front of their guns. The dive continued for 14,000 feet. Our pilots were certain that the enemy was badly hit, and one of them reported that "his undercarriage was lowered half-way down, and he was attempting to fly eastwards at cloud level. The rear gunner was probably hit, as no more fire was encountered. It is improbable that the enemy aircraft got home." Once more the clouds, plus the failing light, hid the final scene from the eyes of the pursuers.

A Fight Over France

NEWS from France about fighting in the air rarely comes through British channels, but our French contemporaries get a fair supply of information about the ceaseless activity there, and we are much obliged to them for telling us stories of the doings of the gallant *Armée de l'Air*. We have taken the liberty of translating the following story rather freely from *La Guerre Aérienne*.

This is an account of a victory gained by two young pilots on patrol, a Lieutenant and a sergeant pilot, after a headlong chase which took place very low down, literally "hedge hopping."

The enemy machine, a Dornier 215, had ventured audaciously over the north-east of France. After a long reconnaissance over our lines, it turned for home at a great height, about 6,500 metres, following the valley of the Marne.

Our two chasers, on patrol over Champagne, would have returned without having seen it, but for the following message which they received over the radio: "Gain height, enemy aircraft in the north."

The pilots opened the throttles of their Moranes and started searching the sky. A black speck over Châlons: that's him! The Moranes easily overtake the Dornier. Their approach is so confident that the enemy realises that he is lost, but the German pilot, a good sportsman, takes the only chance and goes into a 6,000 metre power dive right down to the ground in hopes of breaking off the fight. His dive is so vertical, so desperate, that our two chasers are astonished that their adversary (which is not a pursuit machine) has not torn off his wings in pulling out of the dive. Naturally the Moranes follow it down and they pull out at 50 metres, right on the tail of the Dornier. It looks like escaping from them, for they cannot fire. Trees and houses rush past them, they almost touch the ground. The usual attack from below cannot be used, so our two pilots attack from either side, from above and behind. The Dornier fights back stoutly. Its pilot keeps changing course to escape the fire of his pursuers, and all the while it is getting nearer to Germany, always zig-zagging, always "hedge-hopping" to throw off its attackers. In the fields the peasants raise their heads to watch this cyclone rush past.

Near the Meuse the Dornier is forced to surrender. It is not badly hit, but is forced to land near a village owing to the damage done to the wings by the French bullets. Its

Courtesy "La Guerre Aérienne."

three occupants jump out of the wreck and try to set fire to it, but our men soon put a stop to this. They wheel above the wreck and machine-gun it ceaselessly to prevent the three enemy airmen from destroying it.

This aerial guard over the grounded prisoners was kept up until some ground troops arrived at the double. Then it was all over: a section of infantry took charge of the Dornier and replaced the flying sentries.

The victorious Lieutenant and sergeant pilot returned to their aerodrome and counted their wounds, or rather those of their Moranes, which were riddled with bullets.

Agonies of Cold

THE fighters, British and French, get all too little to do, but when they get a chance to use their guns they enjoy the war in the air more keenly than any other airmen can do. The bombers, however, have to keep up their sweeps and their reconnaissance flights even in the bitter weather of this winter.

On these flights every man in the crew uses his eyes to aid in the selection of potential objectives for our bombers. The pilots become familiar with the lie of the land in every sort of weather. Sunlight and moonlight throw different shadows. Rain and snow may change the appearance of a place almost out of recognition. But Royal Air Force airmen have made their visits in all these varying circumstances and are now unlikely to go astray. They know the position of enemy aerodromes, and where to beware of anti-aircraft batteries and searchlights. All this information will be of great value when the time comes for our aircraft to make their way to their allotted objectives. On a single flight one aircraft encountered first lightning and then a snowstorm. At 20,000 feet ice formed on the airscrews. The pilot took off his gloves for a moment to adjust his controls and was frost-bitten. As the winter progressed the threat from cold increased. There have been instances of ice forming within an aircraft at 8,000 feet. At relatively low altitudes it is not uncommon for ice to form in masses on the wings. One aircraft, while on the way to Munich, had such an experience in cloud at 1,000 feet. Ice completely covered the front windows of the cabin, and there was extensive ice formation on the main wings. Ice could be heard coming off the blades of the airscrews and striking the sides of the nose of the aircraft. Continuous movement of the controls was advisable to prevent them from freezing up. Some members of the crew were in such pain from frostbite that they butted their heads on the floor and navigation table. Electrical storms are no less disconcerting. An aircraft flying through such a storm sets up what is known as a "brushing discharge." It is outlined in a

Service transport : The most practised student of aircraft identification may be stumped by the R.A.F. machine on the right into the capacious fuselage of which supplies are being loaded for delivery to an isolated post. It is a Fokker four-engined F.22. Below, a German cyclist detachment is emplaning on a Ju 52 bomber transport.

weird violet light. Every movement of the crew gives off sparks and a noise of crackling.

It is in such conditions that our airmen collect information, photograph towns, fortresses, transport routes, and naval and other harbours, and record landmarks for those who come after them. At night the enemy opposition to the Royal Air Force over Germany has not been very effective. Their fighter aircraft, for instance, have repeatedly failed to intercept our night reconnaissance aircraft. But on occasion, fire from enemy anti-aircraft guns, working in close co-operation with many searchlights, has forced us to take evasive action. Anti-aircraft gunfire, however, varies in accuracy. The pilot of an aircraft that flew over Berlin reported that the defence organisation there must have been badly shaken. Not a shot reached home, although it was obvious that every available gun had been brought to bear on the visitor. For the most part the projectiles used in this case seem to be experimental. Among the familiar ones generally used by the enemy are the "flaming onions," a string of balls of fire shot into the air. It is not on record that they have ever done any damage, either in the last war or in this.

Day reconnaissance is a very different matter. Though it is less handicapped by adverse weather, it is exposed to an enemy that can see. The fact that our aircraft have been able to take photographs at low altitudes over enemy territory is proof of the crews' courage and enterprise, and of their ability to make the most of the prevailing clouds to hide in.

Unmolested

THOUGH nearly all our aircraft have come under fire over Germany, there have been remarkable exceptions. Instances are recorded where Royal Air Force aircraft photographing an enemy aerodrome, have apparently gone unnoticed by German fighters just about to land. One British aircraft, flying alone over Germany, encountered three German fighters, all of which kept their distance and did not offer battle. Another Royal Air Force aircraft drove off three attacking enemy fighters at about 200 yards. These last were exceptional cases. At times the German fighters may have seemed reluctant to meddle with intruders, but generally our bombers have to face determined resistance by enemy aircraft. Every photograph that appears and every piece of information brought back is a witness to many feats of endurance, patience and skill.

The Coastal Command also has to carry on its ceaseless work despite the cold, but as its machines do not need to fly at great altitudes their crews suffer somewhat less. Moreover, they have lately been doing quite a lot of rescue work for mariners whose ships have been mined or bombed, and the interior of an aeroplane must seem quite cosy compared with the lot of the wretched sailors in open boats or even clinging to rafts. Not long ago an aircraft spotted ten men in a small lifeboat in the North Sea. It afterwards appeared that they were the crew of the trawler *Theresa Boyle*, of Granton, on the Firth of Forth, which had been sunk by a German bomber 120 miles out to sea, and the men had been in the boat for over 50 hours.

When the aircraft crew observed the open boat it was being buffeted in a heavy sea. Two of the men aboard were trying to row. It was obvious, however, that they were nearly at exhaustion point, because the boat was drifting at the mercy of the wind. The aircraft went down low over the lifeboat. Eight of the occupants were seen to be prostrate. The pilot saw a number of them wave their arms feebly as they lay stretched out in the bottom of the boat. The aircraft set off to bring help and found two minesweepers 15 miles away. The pilot asked the minesweepers by lamp signals to follow him. By firing coloured lights the pilot guided the two minesweepers to the open boat. He circled round until all the ten occupants had been safely picked up. The aircraft resumed its patrol. When it was about two miles away, the rear gunner reported that one of the minesweepers was flashing a message by lamp. The pilot went back and asked if anything was amiss. "No," was the answer. "These ten fellows we have collected just want to say thanks to the R.A.F."

Another machine of the Coastal Command, while on patrol over the North Sea on Tuesday, February 13, saw three ship's lifeboats, each with a number of men in it.

The pilot immediately set off in search of help. A steamer was sighted and directed towards the position where the lifeboats were seen. The distance was equivalent to three-hours' steaming. Before the ship had reached the position the approach of darkness forced the aircraft to leave. The steamer succeeded in finding the lifeboats and picked up all the men on board.

One M.P., filled with indignation at the ruthless attacks on our fishing vessels, suggested that we ought not to rescue German airmen who came down on the water. To this the First Lord replied that the ordinary instincts of humanity required the rescue of drowning men or castaways should they be observed by His Majesty's ships in the course of their duties. This reply evoked a loud cheer.

It is not often that the Fleet Air Arm gets into the news, but the Navy is proverbially the Silent Service, and the Fleet Air Arm is part of the Navy. Either in carriers or as catapult aircraft in cruisers and capital ships, the machines of the F.A.A. go where the ships of the Navy go and play their part in their work. The Admiralty has, however, admitted that the German ship *Wakama*, 3,771 tons, was located by an aircraft from one of H.M. ships in the South Atlantic. On being ordered to stop by the aircraft, the German crew set fire to the ship and then scuttled her. The British warship later picked up ten officers and 36 men. That just gives up an inkling of what the F.A.A. is doing, and helps to explain how it is that, though we started the war with fewer cruisers than we should have liked to possess, yet it is possible for those that we have to keep the wide oceans under their observation.

Their Majesties at the Gloster works. With them in this picture are Mr. "Jerry" Sayer, Mr. Hugh Burroughes, Mr. F. McKenna, and, on the extreme right, Mr. F. S. Spriggs.

THEIR MAJESTIES at "GLOSTER"

LAST week we recorded the visits to the aircraft factories at Yeovil and Bristol of Their Majesties, the King and Queen. There is not a more hard-working couple among their subjects than Their Majesties, and on this occasion they gave up their week-end in order to see for themselves, during the Saturday, how work is progressing at the Gloster factories.

Their Majesties arrived at 10 a.m. accompanied by Air Vice-Marshal Portal, Air Member for Personnel, and by Mr. E. J. H. Lemon, Director-General of Production. Mr. Lemon presented to Their Majesties Mr. F. S. Spriggs (chairman and managing director of the Gloster company, and chairman of the Hawker-Siddeley group), and he in turn presented Messrs. Hugh Burroughes (director), F. McKenna (director and general manager), W. G. Carter (chief designer), R. V. Atkinson (works manager), P. E. G. Sayer (chief test pilot), Wing Commander Jones (A.M. overseer), Sqn. Ldr. Reynolds (A.M. overseer), C. C. Copperthwaite and J. H. Larrard (resident technical officers), and A. C. Coulam (A.M. inspector-in-charge).

The King's Amazing Knowledge

During the tour of the works and drawing offices Their Majesties saw Hawker Hurricanes and Henleys, and Gloster Gladiators, being prepared for test flights, and in the experimental shops they inspected new prototypes of which nothing may be said. As usual the King displayed an amazing knowledge of the different types. How His Majesty can, in view of his vast and exacting duties, retain in his memory so many facts about aircraft is a never-ending source of astonishment to those who have had the good fortune to come in contact with him. The fact remains that he does remember details of aircraft in the most remarkable way. The Queen also displayed the keenest interest in all she saw, but as was natural she was more concerned about the life and welfare of the workers than about technical matters.

After light refreshments in the board room, Their Majesties departed amid a veritable tornado of cheering. They expressed their pleasure and satisfaction with what they had seen, and commented particularly upon the conduct and deportment of the workers generally.

For the benefit of the thousands of new readers of *Flight* it may be recalled that the firm came into being during the last war, and that high-speed aircraft have always been a Gloster speciality. The "Bamel" won the Aerial Derby three years in succession (1921-22 and 23), and several seaplanes were designed and built for the Schneider Trophy Contests.

The company was taken over by the Hawker company in 1934 and is thus now a subsidiary of the Hawker-Siddeley group. That is not to say that it has in any way lost its individuality. Far from it; the firm is hard at work on original new designs, but of these nothing may be said at present for obvious reasons. The mantle of chief designer has now fallen upon Mr. W. G. Carter, after the departure of Mr. H. P. Folland some years ago, and the name "Gloster" is likely to remain prominent in British aviation for a long time to come. Mr. Carter was Hawkers' chief designer, a position now held by Mr. S. Camm.

THE SOUTH AFRICAN AIR FORCE

Present Organisation Reviewed : Early History : Trials of the Pioneers

By MICHAEL TERRY, F.R.G.S., F.R.E.S.

Articles on the Royal Australian Air Force and the Royal New Zealand Air Force, by the same author, appeared on November 16, 1939, and January 11, 1940

Training in South Africa. A Westland Wapiti following an unspecified portion of the coastline.

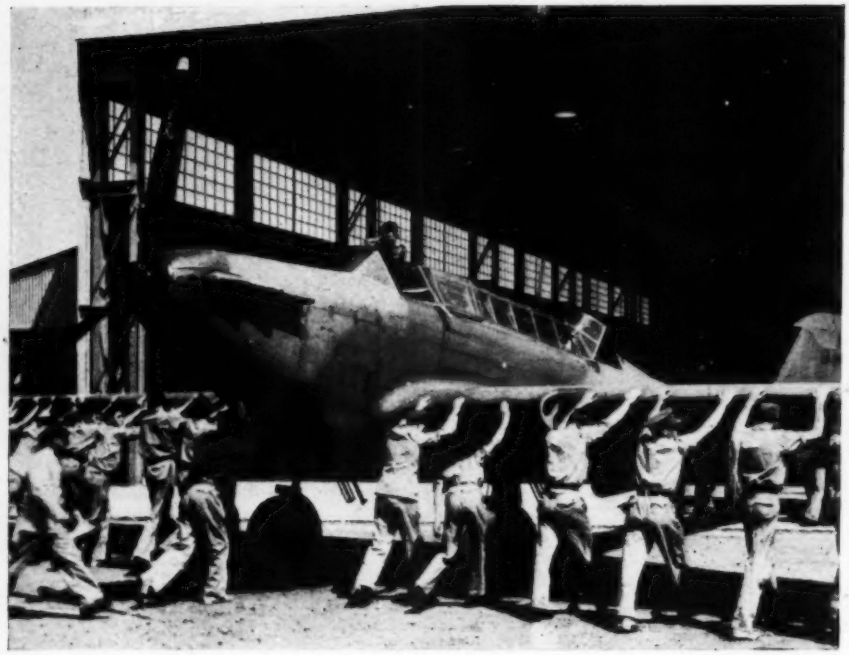
THREE thousand South Africans served in the R.A.F. during the last war, and 260 were killed in service. Their military air-mindedness developed from 1911, when Compton Paterson and E. F. Driver introduced aviation into South Africa at Kenilworth Racecourse, eight miles from Cape Town.

The effect of alternate rain and sun upon the fabric of Paterson's biplane was disastrous. The tail fabric split when he was taking off, formed into a bag, forced the tail down, started a vertical climb and resulted in a complete crash, which put Paterson in hospital for two weeks.

Nevertheless, the interest which was promoted made the Government ask him and Driver to form a flying school for officers at Kimberley in 1913. Under Paterson they built their own aircraft, which contained ideas of Curtiss, Caudron and Farman, but were largely Paterson. 50 h.p. Gnome rotary engines were fitted, which took the machines to 1,500 feet. Except for the unfortunate death of Cheesman, this was a highly successful training scheme and gave birth to the South African Aviation Corps, comprising Wallace, Creed, Turner, Emmett and van der Spuy.

These men, who had been moved to Farnborough,

Col. P. van Ryneveld and Capt. C. Q. Brand in front of their Vickers Vimy "Silver Queen" before the start of the flight to South Africa in 1920.



Manhandling a Fairey Battle into its hangar at Water Kloof, Pretoria.

England, all volunteered, when the first German war broke out, to serve with the R.F.C. Under Captain Wallace, after some active service in France, they reached Walvis Bay on the last day of April, 1915, with three Henry Farmans and two B.E. 2cs. After that campaign, ended by an Armistice on July 6th, the unit proceeded to Cape Town, where it was demobilised. Later that year, the unit having been again mobilised, 119 N.C.O.s and men sailed for England to join the officers who had returned there after the temporary disbandment. Those who had served in South-West Africa were kept together by forming them, early in 1916, into No. 26 Squadron R.F.C.

After additional training they were shipped to German East Africa. Arriving at Mombassa on January 31st, 1916, with eight B.E. 2cs, they found the propellers which belonged to them had not been packed when they left England. However, they had five unsuitable spares, and made them serve pending arrival of the right ones.

This second African campaign continued until the beginning of 1918, when the Squadron left Zanzibar for Egypt in January, and was formally disbanded at Blandford in July. Thereafter the officers and men were absorbed into the R.A.F. and lost their identity. They suffered the same fate, in this respect, as about 2,000 of their countrymen who were specially recruited in South Africa by Major Miller, D.S.O., O.B.E., in October, 1917.

South Africa's Air Ace was Flt. Lt. Beauchamp-Proctor, who, with Lt.-Col. Bishop (the Canadian), was the only other airman to win the Victoria Cross, D.S.O., M.C. and the D.F.C. His victories included 22 machines destroyed, 16 driven down out of control and 16 kite balloons destroyed. His countryman, Capt. McCubbin, piloted a machine in which a sergeant machine-gunned the gallant and redoubtable German pilot, Capt. Immelmann. This flyer, by a curious twist, was also a South African, and was educated at Cape Town. Flt. Lt. Kinkead, another South African, served in the R.N.A.S. before joining the R.A.F., in which he became a member of the Schneider Trophy team in 1927.

As in the case of Ross and Keith Smith, the Australian war pilots who flew home and provided a post-war link for aviation, the South African link was forged by Pierre van Ryneveld and Quentin Brand, who left London in

At the Rand Airport, Germiston. The aeroplanes are two Junkers Ju. 52s and an Airspeed Envoy.

A Junkers Ju. 86 belonging to South African Airways. These machines can be converted into bombers.

February, 1920, for the Cape. They, too, used a Vickers Vimy biplane, but their "Silver Queen" crashed hopelessly, landing in the dark on rough ground strewn with rocks about 530 miles south of Cairo. Determined to carry on, they salvaged the engines, put them into another Vickers Vimy, called it "Silver Queen II," and got as far as Bulawayo and another wreck. For the third and last lap they climbed into a D.H.9, the "Voortrekker," and reached Cape Town in March, 1920. Brand became Sir Quentin, and is now an Air Commodore in the R.A.F.; van Ryneveld became Sir Pierre, and is now Major General, D.S.O., M.C., Chief of Staff of the Union Defence Forces.

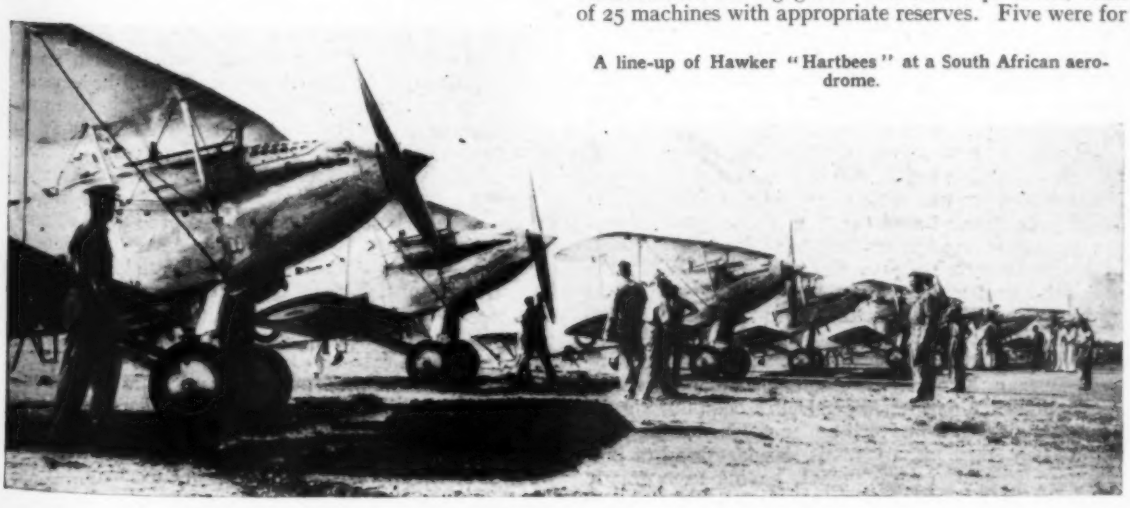
General van Ryneveld and General van der Spuy, M.C., originally of the S.A. Aviation Corps, who is now military adviser in London, then organised the South African Air Force as a section of the Army. Originally the air mechanics were dressed in plus fours and puttees, like the Guards, but now they wear shorts. Forage cap, peaked cap without a black band, or a narrow-brimmed sun helmet are worn according to occasion or the weather. The material is "veld" colour, practically the same as khaki, but named otherwise for local reasons. The pilot's wings have the arms of the Union, surmounted by a Crown, in place of the letters R.A.F. to which we are accustomed. The lapels of the tunic carry brass badges composed of laurel leaves and a pair of wings with the letters S.A.A.F. for one side and Z.A.L.N. for the other.

Ranks are all the same as in the Army, and so is the scale of pay, plus flying pay and instructor's pay.

The force was formed in October, 1920, under a Director of Air Services in charge of flying, but expansion was slow. By 1934 it amounted to only one Training and two-thirds of a Bombing Squadron, manned by 22 pilots and 250 airmen. The first separate item in the Budget for the Air Force appeared in 1931, when £30,256 was allotted for aerodromes, stores and aircraft. Five years later this grew to £330,128; now the latest air force estimate is £800,000.

In 1934 a Five-Year Programme was begun. By March, 1939, its aim had been more than achieved, the establishment having grown into nine Squadrons, each of 25 machines with appropriate reserves. Five were for

A line-up of Hawker "Hartbees" at a South African aerodrome.



training, two were bomber-fighters, one for reconnaissance, and one for troop-carrying. They had 432 pilots and 2,080 air mechanics. Their aircraft, apart from trainers, included D.H.9s, Wapiti, Hartebeeste, and Hawker Fury. Expansion, of course, continued till the outbreak of war, since when it has been greatly accelerated. Equipment is being brought up to date by purchase of the latest machines from England, including Blenheim bombers.

Non-Military Work

Like the Air Forces of other Dominions, the S.A.A.F. was given non-military tasks during the inter-war period.

Photographic survey for mineral-bearing formations, hydrographical survey of the coasts of South Africa, and a widespread topographical survey, even as far afield as the Kalahari Desert and the Zambesi River, were some of their peacetime exercises. Forests and crops were sprayed from the air to control pests and diseases; locusts were similarly attacked with arsenical preparations. There was more serious service during the Rand revolt in 1921, the Bondelswart rebellion in South-West Africa, and the Ovamboland rebellion on the border between Portuguese West and South-West Africa. Two men were killed in the Rand trouble, and bombing was carried out.

Air Mail was pioneered in 1925 with an experimental service from Cape Town to Durban, lasting six weeks. For 950 miles along the coast service pilots flew D.H.9s, carrying 450 lb. of mail. After this demonstration air mail was abandoned for nine years, and civil aviation languished despite the sustained efforts of the ex-war pilot, Major Miller. Now it has developed, under the leadership of S.A. Airways, into the largest Dominion organisation, and is second only to Imperial Airways. Two million miles a year are flown, and, what is highly important, a considerable reserve of pilots and machines has been created for war service.

Conversion

The link between civil and military aviation is even closer in South Africa than in other Dominions. When war began, the airlines were divided into a Defence Wing and a Commercial Wing. All the 18 Junkers Ju.86 machines, representing 62 per cent. of S.A. Airways' Fleet, were taken over, converted into bombers and put to Seaward Defence. Some Ju.52 Junkers were also converted for military use. The consequence has been to reduce air services to less than 30 per cent. of those operated before the war.

The main technical training school, depot, flying school and equipment establishment of the S.A.A.F. is at Roberts Heights, near Pretoria. Already £2,000,000 has been spent on it. A few aircraft, without engines, have been built there during the last twelve years. Now the engineering industry of South Africa is being geared for general war production, with the idea, eventually, of producing engines as well.

Most of the pre-war service machines were bought in England, as it was found better to buy slightly out-of-date types at reduced prices than to go for full-scale production at Roberts Heights. Coupled with this was the understanding that, if a war broke out, the Union would be able to buy the very latest types for their first-line defence.

Last September there were service stations at Cape Town, Durban, Kimberley, Pretoria, Johannesburg, and Bloemfontein. A new scheme to train 1,000 pilots for the Reserve in six years was well under weigh, having been instituted on April 1st, 1937. It was far ahead of programme. This local commitment, having been greatly supplemented since last September, has played a major part in reaching the decision not to join in with the Empire Training Scheme inaugurated in Canada.

Members of the Women's Aviation Association receive instruction in engine maintenance. The crankcase suggests that "simple things first" is the motto of the association.

When the local scheme commenced, it took recruits between the ages of 17 and 32. In the first year of non-continuous training they put in 70 hours' flying and 74 hours on the ground. In the second year 40 hours' flying and 30 hours' ground work, or in continuous training in the first year one period of 30 days and another of 15 days; in the second year the same service was required. Non-continuous training was at those of the 30 flying clubs and schools approved by the Government; continuous training was at Roberts Heights or at some other service centre.

After about 300 men had been trained in this manner, a more concentrated scheme of training became necessary to prepare for a more active part in this war. Now a far larger number of pilots and air crews will be rapidly made efficient. Having signed on for duration of war they go to either Germiston, Bloemfontein, Baragwanath or Pretoria, but the entire resources of flying clubs and schools are being used as well.

Naval Reconnaissance

In December last the Seaward Defence Force was started. It was composed of trawlers, mine-sweepers and air squadrons based at Cape Town and Durban, with patrols as well at Port Elizabeth and East London. Each day the pilots fly far out to sea, and it will be remembered that on December 2nd they sighted the German liner *Watussi*, ordered the captain to change course to Simonstown, the naval base, and were escorting him there when the Nazis scuttled their ship.

At the moment there are about 400 South Africans in the Royal Air Force, wearing ordinary R.A.F. uniform and therefore indistinguishable from Englishmen. On the 19th of last September, one South African did, however, distinguish himself by dropping a bomb on the conning tower of a U-boat. There was, he reported, a colossal explosion which lifted the stern right out of the water. He was sure of a kill.

Meanwhile expansion proceeds rapidly in the Union. The latest move has been to form an Auxiliary Air Force, composed of women, for ground work, either for office duties or to clean down machines and keep hangars tidy. Their status is similar to the A.T.S. here.

THE AIR WAR in FINLAND

Some Observations on Strategy and Equipment

FOR several successive years at the Hendon Displays we all watched the Bulldog fighters of the R.A.F. performing with grace and agility, and sometimes thought what fine machines they would be in a real air combat. We did not want the R.A.F. to be involved in war, but somehow it seemed a waste of good effort that such good fighters should be produced but should grow obsolete without a chance of putting their qualities to the use for which they were intended. Some few of us may have read a short notice in the papers to the effect that Finland had bought a few Bulldogs, but it never occurred to any of us that it was those machines, not the ones in possession of the R.A.F., which would fire their guns in anger and shoot down enemy aircraft. Yet so it has turned out. Those Bulldogs in Finland have given a very good account of themselves against the Russian fighters and bombers. Now there have been added to them Gladiators, and, for bombing, a goodly number of Blenheims, while many more machines of various types are on their way from several countries. Finland had in all sixty fighters and a small number of bombers, mostly of British design, when the troops of the Soviet invaded the country. They included seven different types of machine, which must have complicated maintenance and the provision of spare parts. Soon the Finnish air arm will have been multiplied a good many times. There will be a number of new types, and the problem of maintenance will be still further complicated, but in a good many cases the new machines will be accompanied by foreign volunteer pilots who will be able to fly them. Reports tell that the Finnish pilots themselves are very good, and now finishing schools have been established to put anyone who can fly at all through a course of military aeronautics. The superiority of the Finnish air defences over the Russian air attack is shown by the reliable report that up to January 20 no fewer than 240 Russian aircraft had been destroyed, 59 by anti-aircraft guns and the rest by fighters, while the Finns had only lost 15 machines. It is an astounding result and implies real brains as well as skill and courage on the part of the Finnish air arm. There are, in fact, numerous instances of clever use by the Finns of their small force. In bombing they have shown that they appreciate the value of concentration and of economy of effort. They have given their raiders definite objec-

A Russian SB bomber brought down by Finnish anti-aircraft guns. The SB, shown here with in-line engines, can alternatively be fitted with Cyclones.

An R-5 general-purpose machine, at one time working with the 44th Russian Division, in the hands of the Finns. A similar machine with a more powerful engine is used for ground-attack work.

The extraordinary little I-16 single-seater fighter. This Russian type met with considerable success in Spain. It has four machine guns.

tives, and those objectives have in most cases been reached.

For many years past the Russian flying corps (it is not a proper Air Force, being part of the Army) has been a sort of bogy to the rest of Europe. It is now shown up as a bubble, which the Finns have pricked. What respect can one feel for a Higher Command which, while relying largely on its flying corps, commences an invasion of such a country as Finland at the beginning of winter? A Russian Tsar once talked about "General January and General February," on whom he relied to discomfit the British, French, Turkish, and Sardinian troops in the Crimea. In January, 1914, *Punch* published a cartoon of the Russian bear advancing through a snowstorm and exclaiming, "My Season!" But when it comes to meeting the Finn on his native ice and snow it seems that the Russian is not a good winter soldier. In particular, his airmen have shown up as fair-weather pilots. As few of them have had much more than 100 hours' flying per annum, this is perhaps hardly surprising.

Again, what hope can there be of successful military operations when the army commanders have only equal authority with the civilian Commissars who accompany the regiments, divisions, etc.? It recalls the battle of Dunbar, when the Scottish general, David Leslie, had completely outmanœuvred Cromwell and seemed about to destroy his army, but that the Presbyterian ministers who were with the Scots obliged Leslie to leave the hills and advance across the plain, with the result that Cromwell utterly destroyed the Scottish army. One would have thought that such things had been left behind with the seventeenth century, but though Commissars are hardly ministers of religion, we see the same sort of thing repeated in the Russian forces of to-day, with much the same result.

At the outset the Russians made mass attacks in the air as well as on the ground, and struck in the north, in the south-east, and in the south-west. They had evidently been studying the German tactics in Poland and were trying to copy them. They aimed at destroying with bombs the Finnish aerodromes and the *moral* of the Finnish population, and in both objects they failed. The attacks on the aerodromes were laughable. One hangar was bombed to destruction, and in it reposed at the time a single Moth. It is sad to relate that that Moth was completely written off.

The Russian dispersion of effort did not pay, but in any case their bombing was inaccurate. In the last few weeks it seems to have improved in accuracy. The Russian pilots were particularly deficient in ability to navigate, and it is a fact that when the leader of a formation was shot down

After dissection a Russian bomber (Z.K.B. 26?) is carted off for study.

A Russian SB bomber photographed in Spain. It will be seen that the machine is of creditably clean design.

the rest of the pilots usually were lost. They dispersed and nothing more was heard of them. Flying over Finland in winter calls for especially good navigation. The visibility is naturally apt to be of the worst, and the lakes in the south, which in summer would be good guides to a pilot, in winter are frozen and covered with snow, so that they look just like all the rest of the landscape. The tactics of the Russian bombers are reported to have been bad, and so likewise were the tactics of their fighter pilots when attacked. The Bulldogs and other fighters of the Finns made rings round them and shot them down in great numbers. The Gladiators would find the job still easier. All the same, it must not be supposed that all Russian pilots are of inferior quality. That was hardly to be expected of a nation which has produced a Sikorsky. Finnish pilots have themselves testified that some individual Russian pilots are very fine indeed.

No praise can be too high for the tough *moral* of the Finnish civilians. They simply refuse to be terrorised into any thought of surrender. Their wooden houses have been destroyed in great numbers by incendiary bombs, and when the fire brigades have been machine-gunned and have taken shelter their hoses have frozen. The actual number of civilians killed has been very small in comparison to the size of the Russian bombing effort. The fight in the air has resolved itself into one of brains against bulk, mind against mass. There is good reason for hoping that when all their reinforcements of aircraft from abroad have reached them the Finns will be able to defeat the air side of the Russian attack on their country.

Few people know how the Finnish Air Force started, and how it came to choose the swastika as its distinguishing mark. It is, therefore, interesting to note in the current issue of the Danish aviation journal, "Flyv," that in March, 1918, during the Finnish fight for freedom against Russia, the Swedish Count Eric von Rosen arrived one day at Wasa in his Morane parasol monoplane, piloted by his compatriot, Nils Kindbergh. He made a present of the machine to the White Army, and the swastika, which was the Count's personal "mascot," was retained by the Finns, not only on that machine, but on all which were to follow.

The original organisation of the Finnish Air Force was largely planned by Germans who had been instructors during the war of independence, and bases for seaplanes were established at Sordavala, Willmanstrand, Helsingfors and Björkö. An aerodrome for landplanes was established at Uttis. Further development was planned by an English commission in 1924, and stress was laid on the use of seaplanes, due to the large number of lakes in Finland. It was found, however, that these were unsuitable for many months of the year, and in 1928 the seaplane programme was changed to a landplane programme, and many aerodromes were established.

So far as is known this machine, in which Kokkinaki was forced down in New Brunswick on a flight from Moscow to New York, is similar to the Z.K.B.-26 bomber. The engines are of the M.85 type which is virtually the Gnome-Rhone K.14.

Actually the present organisation was founded in 1938, when all Finnish aviation was placed under the chief of the Air Force. It is believed that at the time of Russia's unprovoked attack on Finland that country had something like 120 aircraft in her Air Force. They were either bought from abroad, or built under licence in the Government aircraft factory at Tammerfors.

Of single-seater fighters Finland had Fokker D.21s, Hawker Furies, Gloster Gamecocks and Bristol Bulldogs. For reconnaissance and for Army co-operation work Finland used Fokker C.Vs and C.Xs, and Avro Ansons. Naval co-operation was carried out with Junkers W.34s and Blackburn Ripons, and of bombers Finland had the Hawker Hart and the Bristol Blenheim.

In addition to imported aircraft, or aircraft built under licence, Finland has produced the "Pyry" single-seater fighter, said to be capable of about 250 m.p.h., and four training types known as "Wiima," "Tuisko," "Kotka" and "Aero A.25." In the way of engines, Finland also produces Bristols under licence in the Government factory.

SERVICE AVIATION

Royal Air Force and Official Announcements

Casualties

THE Air Ministry regrets to announce the following casualties on various dates:—

KILLED IN ACTION.—Cpl. F. Chilton (513704); P/O. D. G. D. Maynard (42144).

PREVIOUSLY REPORTED "KILLED ON ACTIVE SERVICE" NOW REPORTED "KILLED IN ACTION."—A/C.1 E. H. Humphry (539268); Sgt. S. H. Potts (580464).

PREVIOUSLY REPORTED "MISSING, BELIEVED KILLED," NOW REPORTED "KILLED IN ACTION."—Act. Sgt. F. G. Goodwin (564696); F/O. J. R. Hollington (37881); Act. Sgt. E. B. Morgan (580738).

PREVIOUSLY REPORTED "MISSING," NOW REPORTED "KILLED IN ACTION."—Act. Sgt. A. J. Tilley (513966); F/O. A. R. Vaughan-Williams (33203).

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. H. Hanne (564212); A/C.1 E. Vick (540323); Act. Sgt. G. L. Williams (524733).

DIED OF WOUNDS RECEIVED IN ACTION.—A/C.1 G. W. Geddes (539328).

MISSING.—P/O. A. Barkley (41246); Sgt. J. F. Bremner (742099); A/C.2 D. J. Drury (625339); A/C.2 A. Hinchcliffe (610120); P/O. R. C. Lloyd (41594); A/C.1 R. S. Morton (551834); Cpl. D. Turner (526986).

KILLED ON ACTIVE SERVICE.—Sgt. L. C. Chenery (581170); A/C.2 W. Heron (631890); F/O. the Hon. W. D. S. Montagu (91111); P/O. R. J. Shellard (76592); Sgt. F. T. M. Smith (518492); P/O. B. O. C. Stevens (33415); P/O. G. S. Taylor (36199); A/C.2 L. J. Wakely (551324); Sgt. D. P. Watson-Parker (741702); Act. P/O. S. M. West (42778); L.A/C. D. W. Whittaker (751038); L.A/C. H. A. Williams (751036).

DIED ON ACTIVE SERVICE.—A/C.1 G. C. J. Aurigo (540675); A/C.2 S. A. Barrett (900568); Cpl. J. R. Birch (510779); A/C.1 H. Clemson (819085); A/C.2 G. P. W. Dunbar (874780); L.A/C. A. Eales (346343); A/C.2 A. Forster (861128); A/C.2 J. W. Gerrish (865652); A/C.2 L. Hollis (549668); P/O. W. R. McComb (40241); L.A/C. J. Mells (508583); A/C.2 J. Richards (850654); A/C.2 G. D. Rogers (646328); A/C.2 P. J. H. Rowe (626639); A/C.1 J. W. Swan (60139); L.A/C. T. S. Wells (510390); A/C.1 E. J. Woosley (639482).

CORRECTION.—A/C.1 J. A. Garrick, previously reported killed in action. The number of this airman is 537306, not 567306.

HEINKEL HUNTER: A Bristol Blenheim fighter, which although an adaptation of a bomber is very formidable. It has a box of four Brownings under the fuselage.

Radio Mechanics

THE Air Ministry announces a new specialist trade category in the R.A.F. Openings are now offered to a large number of men between 18 and 50 years of age with a knowledge of radio apparatus. There will be a fairly stiff examination, and if accepted the applicant will enjoy the unusual privilege of being reclassified, the day after enlistment, as leading aircraftman with pay at the rate of 5s. 6d. a day with allowances.

With the rapidly increasing production of aircraft and the front line strength of the R.A.F. attaining greater proportions, it is becoming necessary to expand the radio communication system which welds that tremendous number of aircraft and crews into one unit for the prosecution of the war. Here, then, if the opportunity for the "Radio Mechanic"—as the new trade will be known—whose duty will be to instal, control, and maintain the apparatus at the highest state of efficiency; no knowledge of Morse is necessary.

The R.A.F. is not calling for the experts in the big factories, where probably they are already doing national work, but for men in the large towns who are familiar with the services of modern wireless and television apparatus. Radio mechanics will first undergo a short course of disciplinary training, after which they will be sent for special training without delay. Most of the men will be wanted for home service, but a certain number will be needed for service in all parts of the world. The recruits will be needed for ground work, but some will have an opportunity to fly. Suitable men will also be wanted as signals officers, but they must have science degrees.

SMALL BEGINNINGS: The practice bombs seem puny—as they are fitted to the carriers of an Oxford—in comparison with those which these Sergeants may one day have an opportunity of delivering.

THE BIG HULLO: Sqn. Ldr. Mackworth, who headed a group of R.A.F. officers lately arrived in Canada, is welcomed by Sqn. Ldr. Jackson, R.C.A.F.

Application for the post of radio mechanic should be made to the nearest combined recruiting centre, or to the Air Ministry Information Bureau, Kingsway, London. If the candidate is considered suitable by the recruiting officer, he will be sent to a receiving centre for a technical test by the trade test board, for which a free travelling warrant will be issued. The Air Ministry states that in no circumstances should candidates give up their civil employment until they have passed their trade test and have been given definite instructions to report for duty.

Nearly 2,000 applications for enrolment in the new trade were received at the Air Ministry Information Bureau on February 14 and there was a similar flood of applicants at recruiting centres throughout the country.

Royal Air Force Gazette

Royal Air Force

General Duties Branch.

Acting Pilot Officer on probation H. B. Skyrme is confirmed in his appointment and graded as Pilot Officer (Oct. 25, 1939); Acting Pilot Officer on probation S. N. Johnson is confirmed in his appointment and graded as Pilot Officer with effect from Sept. 2, 1939, and with seniority of May 2, 1939.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation (Jan. 23):—C. M. Lochhead, K. C. Ritchie.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—(Feb. 1) D. A. Kerr, W. I. C. Inness, V. C. Darling, E. Culverwell, G. Burges, R. P. M. Gibbs, J. R. Fishwick, A. M. Bentley, W. P. Shand, P. B. Chamberlain, W. H. Ingle, R. P. R. Powell, P. E. Warcup, P. M. Astley, J. H. Humphris, P. S. Jolliffe, O. Godfrey, R. J. M. Bangay, M. G. Stevenson, O. J. M. Barron, J. W. Fordham, C. D. S. Smith. (Feb. 6) M. G. F. Pedley, A. S. Ainslie, G. Lowe, J. G Towle, W. A. L. Davis, F. G. R. Thomas, J. H. Greswell, W. G. Moseby.

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—(Dec. 1, 1939) S. W. R. Hughes; (Dec. 5, 1939) M. R. Skeet; (Jan. 1) T. B. Fitzgerald, K. E. Newton, D. H. Ward; (Jan. 31) C. P. N. Brett, C. R. D. Thomas; (Feb. 1) C. W. Bromley; (Feb. 3) J. N. Harris, C. Bellis, P. G. Whitby; (Feb. 6) H. J. Marley, O. R. W. Hammerbeck.

A.V-M. E. L. Gossage, C.B., C.V.O., D.S.O., M.C., is granted the acting rank of Air Marshal (paid) (Feb. 9); Air Comdre. L. D. D McKean, O.B.E., is granted the acting rank of Air Vice Marshal (paid) (Dec. 1, 1939); P/O. E. L. Ford relinquishes the acting rank of Flight Lieutenant (Jan. 25); F/O. W. C. G. Cogman relinquishes the acting rank of Flight Lieutenant (Dec. 16, 1939) (substituted for notification in *Gazette* of Jan. 5); F/O. F. W. Snell takes rank and precedence as if his appointment as Flying Officer bore date Dec. 19, 1939, reduction to take effect from Dec. 19, 1939; P/O. S. P. Bartlett takes rank and precedence as if his appointment as Pilot Officer bore date Aug. 1, 1939, reduction to take effect from Nov. 28, 1939; P/O. F. R. W. Wickham takes rank and precedence as if his appointment as Pilot Officer bore date June 17, 1939, reduction to take effect from Dec. 7, 1939 (substituted for notification in *Gazette* of Jan. 23); Flt. Lt. T. O. Oakes is transferred to the Equipment Branch (Aug. 26, 1939).

The short service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty (Feb. 5):—J. E. S. Bentley, T. M. Calderwood.

Equipment Branch.

The following are confirmed in their appointments on the dates stated:—Flying Officers on probation.—(Jan. 23) G. Robinson, J. P. M. Woolley. Pilot Officers on probation.—(Jan. 2) P. P. Butler, J. Hamilton, R. W. Head, E. F. Wisdom, J. G. Bishop, E. D. Bradfield, J. F. Brewis, M. Collinson, T. J. Heath, A. H. Knowles, A. P. B. Moore, G. W. Northcombe, W. J. A. Pritchett, H. R. E. Rumsey, R. D. Stephens, D. C. Walker.

The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer on the dates stated:—(Jan. 2) L. M. Gilchrist, W. J. Maggs, D. P. Singleton, S. J. Pursey, J. O. Gale, W. F. M. McDonagh, A. McI. Peacock, C. S. Johnson; (Jan. 23) G. A. Hine.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—(Jan. 6) R. F. Folley, J. E. Garwood; (Jan. 8) C. Darke, J. E. Hatfield, H. P. Simpson, M.M., A.F.M.

Commissioned Signals Officer.

F/O. W. M. E. Cannock is promoted to the rank of Flight Lieutenant with effect from Jan. 8 and with seniority of Oct. 26, 1939.

Commissioned Physical Training Officer.

Warrant Officer A. E. Bakewell is granted a commission for the duration of hostilities as Flying Officer on probation (Jan. 11).

Princess Mary's Royal Air Force Nursing Service

The following Sisters resign their appointments on the dates stated:—(Jan. 22) Miss D. M. Holland; (Jan. 27) Miss E. K. Humphrys; (Jan. 31) Miss A. R. Posselt.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

The following relinquish their commissions on cessation of duty on the dates stated:—Flight Lieutenant (Hon. Squadron Leader).—(Dec. 9, 1939) A. C. S. Hall. Flying Officers.—(Nov. 19, 1939) R. D. Sampson; (Jan. 4) J. S. Landers.

The following relinquish their commissions on account of ill-health on the dates stated:—(Feb. 9) Flt. Lt. W. Dawson; (Feb. 8) F/O. B. S. Braithwaite, F/O. D. A. Davies relinquishes his commission on appointment to a commission in the Royal Air Force Volunteer Reserve (Oct. 31, 1939).

The following relinquish their commissions in class CC on appointment to commissions in the Royal Air Force Volunteer Reserve (Sept. 1, 1939):—Flt. Lt. (Hon. Sqn. Ldr.) P. Murgatroyd (Squadron Leader R.A.F., Ret.), Flt. Lt. H. C. Pyper (Flight Lieutenant, R.A.F., Ret.), F/O. (Acting Flt. Lt.) R. C. Pretty.

Equipment Branch.

Flt. Lt. A. F. Best, M.C., relinquishes his commission on cessation of duty (Feb. 1).

The following Flight Lieutenants relinquish their commissions in class CO on appointment to commissions in the Royal Air Force Volunteer Reserve (Sept. 1, 1939):—W. J. Allingham, V. F. Williams.

Royal Air Force Volunteer Reserve

General Duties Branch.

The following are granted commissions for the duration of hostilities in the ranks and on the dates stated:—Pilot Officers on probation: (Dec. 30, 1939) seniority (Dec. 10, 1939) Sgt. D. F. Holland; (Jan. 7) L.A/C. P. T. Candler, J. W. Craig, R. S. J. Foster, B. C. Lee, M. P. Thompson; (Jan. 15) A. C. L. Barrett, E. A. Burbidge, (Jan. 23) L. C. Edwards; Acting Pilot Officer on probation: (Jan. 31) J. H. F. Ford.

P/O. M. A. Smith is promoted to the rank of Flying Officer (May 18, 1939).

The following Flying Officers are transferred to the Administrative and Special Duties Branch on the dates stated:—(Nov. 13, 1939) M. G. Candy; (Jan. 25) T. J. R. Cornewall-Walker.

A.P/O. A. W. Weyman relinquishes his commission on account of ill-health.

The following Flight Lieutenants relinquish their honorary commissions on cessation of duty on the dates stated:—(Oct. 29, 1939) G. V. Comyn, O.B.E., M.C., E. H. M. O'Farrell; (Feb. 4) L. M. Peet.

Administrative and Special Duties Branch.

The following are granted commissions as Flight Lieutenants with effect from September 1, 1939, and with seniority of the dates stated:—(Feb. 12, 1938) Flt. Lt. H. C. Pyper (R.A.F., Ret.); (Sept. 26, 1938) Sqn. Ldr. P. Murgatroyd (R.A.F., Ret.); (Mar. 9, 1939) F/O. R. C. Pretty (R.A.F.O.); (Sept. 1, 1939) Sub. Lt. F. C. M. Evans (R.I.N., Ret.).

The following are granted commissions for the duration of hostilities as Pilot Officer on probation on the dates stated:—(Oct. 25, 1939) E. C. Owens; (Oct. 31, 1939) W. A. McKenzie; (Nov. 20, 1939) E. J. B. Rose, J. B. R. Ellison (substituted for notification concerning this officer in *Gazette* of Dec. 19, 1939); (Nov. 27, 1939) L. Howard-Wilkins, D.S.C.; (Dec. 1, 1939) L. T. Hill; (Dec. 4, 1939) W. E. Gemmell; (Dec. 6, 1939) P. J. Kelly, R. D. Wright; (Dec. 12, 1939) W. F. Endersby; (Dec. 13, 1939) H. A. Thomas; (Jan. 1) D. K Graham, S. N. King, W. L. W. Le R. Walker; (Jan 8) E. G. Fischeles; (Jan. 11) K. W. Cumming; (Jan. 13) W. J. V. Branch; (Jan. 16) C. H. Jeffreys, E. R. Pennell, D.F.C.; (Jan. 17) J. H. Davies; (Jan 20) J. H. L. Dillon-Trenchard, E. M. Lewis; (Jan. 22) W. H. Foster, H. D. Lay, C. W. Waitt, M.M.; (Jan. 23) J. Burr, C. R. Campbell, F. G. T. Dudgeon, E. H. M. Samson, G. H. S. Webber; (Jan. 24) G. H. Bennett, S. P. Lodge, H. S. Newman, H. Nicholls, W. G. Pearson, V. R. Ronald, L. A. Smith, F. W. Turpin; (Jan. 25) G. S. Richardson; (Jan. 26) L. E. G. Ames, C. F. M. Burry, M. Cohen, C. F. Cox, L. M. Dunn, H. A. Grass, Ib. P. Muller, D. R. Tullis; (Jan 27) R. Stallebrass; (Jan. 29) C. J. Bayley, H. Karslake, E. H. Row, G. W. Tookey; (Jan 31) L. W. Snagge.

The following are granted honorary commission in the ranks stated:—(Feb. 6) Squadron Leader: N. Cox-Walker. Flight Lieutenants: G. Baillie, W. E. N. Growdon, R. R. Pattison, W. E. Wood.

The following Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 1, 1939) C. G. Gilbert, T. C. Morgan.

The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer on the dates stated:—(Aug. 31, 1939) J. C. Booth; (Sept. 1, 1939) H. J. Cramp, H. G. E. Durnford, M.C.; (Sept 2, 1939) W. J. Mathews; (Sept. 7, 1939) J. C. Guthrie, R. Hewitt, J. Mutch, M.C., W. C. V. Thomas, H. Whittaker; (Sept. 8, 1939) T. J. Hughes; (Sept. 10, 1939) L. W. Marshall; (Sept. 11, 1939) T. W. Hay, C. W. Langlands; (Sept. 12, 1939) E. W. Jeffreys; (Sept. 17, 1939) L. G. Melio; (Oct. 5, 1939) N. Bury.

F/O. A. D. McC. Blair takes rank and precedence as if his appointment as Flying Officer bore date Dec. 8, 1939. Reduction to take effect from Dec. 8, 1939. (Substituted for notification in *Gazette* of Jan. 19): Flt. Lt. N. R. Fox Andrews resigns his commission (Jan. 5); F/O. S. J. Griffin relinquishes his commission on account of ill-health (Feb. 7).

Equipment Branch.

The following are granted commissions as Flight Lieutenants with effect from Sept. 1, 1939, and with seniority of the dates stated:—(Mar. 30, 1939) Wardmaster Lt. W. G. Olver, M.B.E. (R.N., Ret.); (May 15, 1939) Pay. Lt. V. F. Williams (R.N., Ret.); (June 6, 1939) Lt. W. J. Allingham (I.A., Ret.).

F. C. Bowler is granted a commission for the duration of hostilities as Pilot Officer on probation (Oct. 20, 1939).

The following Pilot Officers are promoted to Flying Officer on dates stated:—(Jan. 12) H. A. Jordan; (Jan. 19) J. C. Jordan; (Feb. 9) C. H. Keeble, E. G. J. Neaves, E. W. Neech, H. S. Paine, W. A. Steward, J. B. Stewart.

Accountant Branch.

Cdr. C. P. Franklin, D.S.O. (R.N., Ret.), is granted a commission as Flight Lieutenant (Sept. 1, 1939).

Meteorological Branch.

D. A. Davies is granted a commission for the duration of hostilities as Flight Lieutenant (Oct. 31, 1939).

Chaplains Branch.

The Reverend J. T. Wanless is granted a commission for the duration of hostilities with the relative rank of Squadron Leader (Feb. 1).

Auxiliary Air Force

General Duties Branch.

No. 903 (COUNTY OF LONDON) SQUADRON.—P/O. L. F. Thurlow is promoted to the rank of Flying Officer (Dec. 22, 1939).

No. 925 (EAST LANCASHIRE) SQUADRON.—Flt. Lt. S. G. Barlow resigns his commission (Jan. 31).

Accountant Branch.

No. 925 (EAST LANCASHIRE) SQUADRON.—P/O. J. Wilson, M.C., is transferred to the General Duties Branch (Jan. 29).

Auxiliary Air Force Reserve of Officers

General Duties Branch.

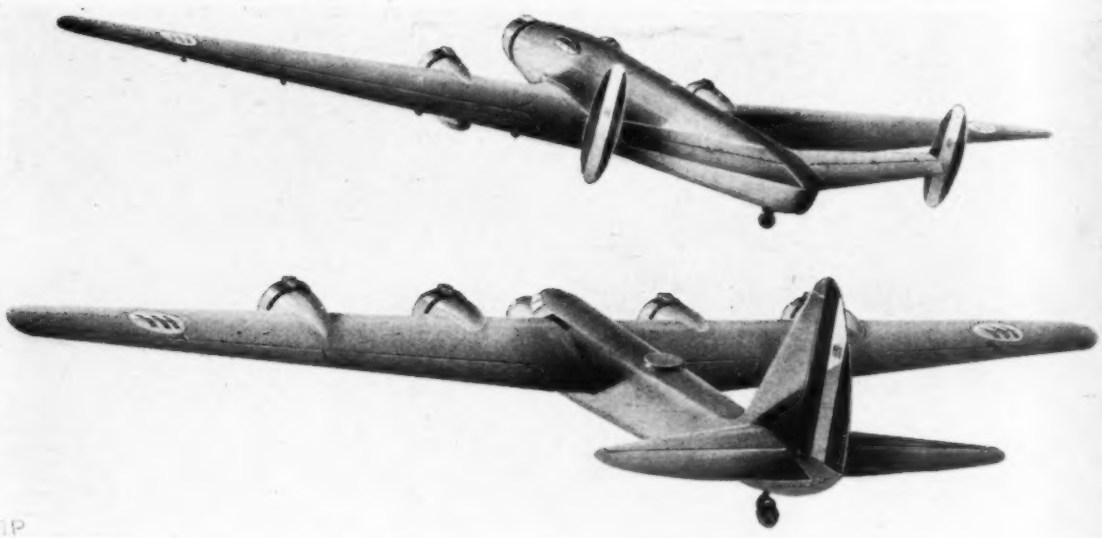
Flt. Lt. H. C. Newhouse is transferred to the Administrative and Special Duties Branch (Feb. 5).

Women's Auxiliary Air Force

The following are appointed Assistant Section Officers:—(Feb. 3) A/W. 2nd class Miss H. Birchall, Miss E. Bond, Miss L. Crewe Chambres, Mrs. M. Elliott, Miss M. Harris, Miss M. Heath, Cpl. Miss N. McK. Newton; A/W. 2nd class Miss M. M. Prosser, Miss E. F. Richard, Miss F. E. Roberts, Miss R. Roger, Miss E. G. Rogers; Senior Sgt. Miss W. M. Walpole; A/W. 2nd class Miss G. J. Worrall; A/W. 2nd class Mrs. D. E. Yates.

The following Assistant Section Officers relinquish their appointments on the dates stated:—(Feb. 1) Miss J. V. Price; (Feb. 11) Miss W. E. Tyrrell.

FOREIGN SERVICE AVIATION



ITALY'S NEW BOMBERS: The upper of these two new Piaggio bombers is the P.23R and the lower the P.50 II. In 1938 the P.23R covered 2,000 km. with a 5,000 kg. load at a speed of 403 km./hr. Double flaps are fitted to this machine: the four-engined type has flaps of more normal design.

Hundred Octane

AMERICAN refineries have taken steps which should soon place them in a position to produce 100-octane fuel at the rate of 40,000,000 tons a month. The present daily production of some of the larger refineries amounts to 100 to 200 tons, while many smaller plants produce from 10 to 30 tons daily.

The selective refining processes adopted utilise either phosphoric or hot sulphuric acid. It is stated that more than 200,000,000 dollars have recently been invested in developing the industry for the large-scale production of 100-octane fuel, for, apart from its employment in aero-engines, it is thought that a further field of application will ultimately be found in road transport.

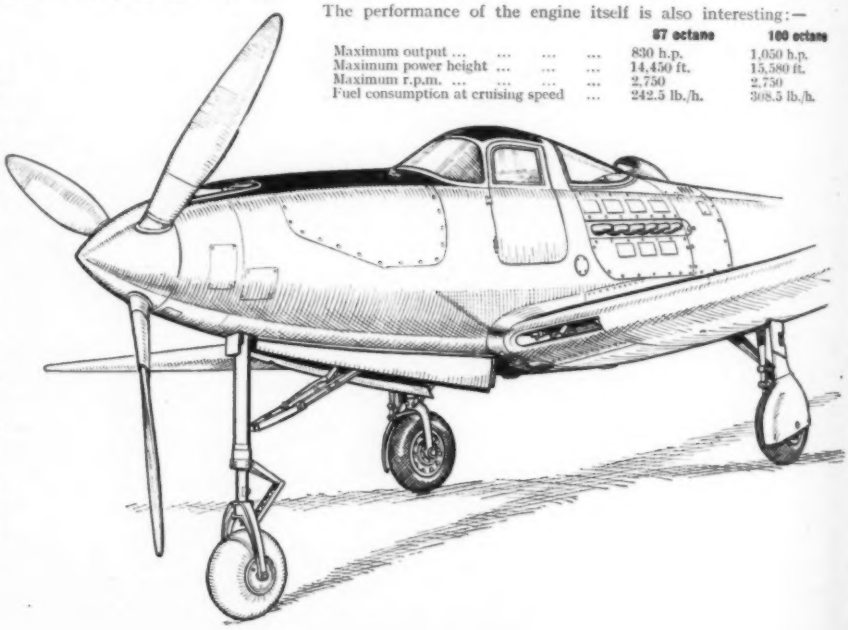
The fuel has been adopted as standard by the U.S. Army Air Corps, which has been using it in limited quantities for a considerable time. In this country it is used on a comparatively small scale for take-off purposes.

The following comparative figures for the performance of the Koolhoven Fk 59 two-seater reconnaissance bomber biplane with Bristol Mercury XV engine speak for themselves.

	87 octane	100 octane
Maximum speed at 2,750 r.p.m.	236 m.p.h.	260 m.p.h.
Height for maximum speed	15,700ft.	17,300ft.
Cruising speed at 60% maximum power ...	192 m.p.h.	211 m.p.h.
At height of	15,700ft.	17,300ft.
Rate of climb at sea level	1,490 ft./min.	2,180 ft./min.
Rate of climb at 6,500ft.	1,630 ft./min.	2,360 ft./min.
Rate of climb at 13,000ft.	1,730 ft./min.	2,540 ft./min.
Rate of climb at 19,500 ft.	1,220 ft./min.	2,050 ft./min.
Time of climb to 6,500ft....	4.2 min.	2.9 min.
Time of climb to 13,000ft.	8.0 min.	5.6 min.
Time of climb to 19,500ft.	12.3min.	8.3 min.
Time of climb to 26,000ft.	19.4 min.	12.2 min.
Service ceiling	31,800ft.	35,700ft.
Absolute ceiling	32,800ft.	36,700ft.
Range with 837lb. fuel at cruising speed ...	621 miles	540 miles
At height of	15,700ft.	17,350ft.

The performance of the engine itself is also interesting:—

	87 octane	100 octane
Maximum output	830 h.p.	1,050 h.p.
Maximum power height	14,450 ft.	15,580 ft.
Maximum r.p.m.	2,750	2,750
Fuel consumption at cruising speed ...	242.5 lb./h.	308.5 lb./h.



SOMETHING OUTSTANDING: A close-up of the Bell P-39, or Airacobra, fighter which is officially stated to have a top speed of over 400 m.p.h., a ceiling of over 36,000ft. and a cruising range of more than 1,000 miles, the cruising speed being about 325 m.p.h. The all-up weight is about 6,000 lb. An Allison vee-twelve engine is located in the fuselage behind the cockpit and drives a three-bladed Curtiss airscrew through a shaft. The engine and its shaft drive have been tested for more than 500 hr. At its widest point the fuselage is only 34in. Overall dimensions are: span, 34ft.; and length 29ft. 9in. The wing loading is 28.3 lb./ft. sq. A 37 mm. shell-gun fires through the airscrew hub (the hole in the spinner is not shown) and there are four synchronised machine guns in the fuselage.

Here and There

AIRCRAFT INDUSTRY BOOMING in U.S.

Chamber of Commerce on Dollars and Sense

JOHN H. JOUETT, president of the Aeronautical Chamber of Commerce of America, trade association of the aircraft manufacturing industry, made the following statements in his report to members at the annual meeting held in New York on January 25.

"Expansion in the American aircraft industry has had a most favourable influence on the employment situation throughout the manufacturing areas. Shop labour in the airplane and engine plants reached 60,000 this month as compared to 30,000 a year ago. This 100 per cent. increase was created by large orders for both military and commercial planes that also have caused a rapid upswing in employment throughout the 50 or more allied industries that contribute to the finished flying machine.

"Under present schedules, production of airplanes and engines alone should exceed $500,000,000 during 1940, more than twice that of last year which preliminary estimates place at $225,000,000.

"The current backlog of the industry is approximately $625,000,000. This compares to $125,000,000 a year ago. Contrary to the impression in some quarters, not all this business is of a military character. Our own air forces have ordered equipment amounting to more than $200,000,000. The commercial orders represented in the industry's current backlog show a satisfactory increase, and our export trade has been growing at a rapid rate.

"Our exports of all kinds of aeronautical equipment, including accessories, reached about $117,000,000 in 1939, as compared to $68,000,000 in 1938. That is not only because of war orders from the Allied Governments and some of the smaller neutral nations of Europe, but also because of a substantial increase in orders from Latin America where the superiority of American commercial and military equipment is recognised. We exported to 91 foreign countries, dominions and colonies out of a potential of less than a hundred.

"If plans for air line equipment both in the United States and in more than 20 other countries are carried out, our manufacturers should have a backlog of approximately $40,000,000 in transport equipment alone within the next few months. Meanwhile, we have made very real progress in private flying. Our new models are improved in design and performance. The number of new planes produced for the private owner last year was approximately 3,700, slightly more than 100 per cent. above 1938. Improved economic conditions and the pilot training programme of the Civil Aeronautics Authority have contributed to a greater demand for private planes of all types, ranging from the light plane to the five-passenger executive models. We have also noted increased interest in this kind of equipment among the countries of Latin America where we expect to develop large markets for private owner planes.

"Military orders from our air forces are divided among 23 of the 45 airplane plants and 9 of the 13 aircraft engine plants. Many companies which can take on more business are receiving sub-contracts whereby they supply parts. If necessary, those plants also can take subcontracts for complete equipment. We may expect to see the subcontracting system expand with the growth of business, and it will tend to increase employment in many sections of the country.

"Meanwhile, our manufacturers are increasing their research and engineering development facilities wherever possible. Some are building their own wind tunnels and other laboratory equipment. Whole sections of their engineering departments are developing new planes, engines, propellers and other accessories to make flying even faster, more reliable and more economical. New manufacturing equipment is also contributing to the progress in producing better planes. For the last six years the manufacturers have devoted to development work approximately 10 per cent. of their gross sales. Reports received by the Aeronautical Chamber in recent weeks show that the industry is continuing to make improvements more rapidly than ever before, because with increased business it can afford greater expenditures for research and engineering."

New R.A.A.F. Chief Arrives

AIR MARSHAL SIR CHARLES BURNETT, who has lately been appointed to take charge of the much-expanded Royal Australian Air Force, arrived in Darwin on February 12 with Air Vice-Marshal Williams who is returning from England after a period of duty there. On their way south to Melbourne, they met the Cabinet at Sydney.

Canadian Aircraft Contracts

THE British High Commissioner in Ottawa (Sir Gerald Campbell) has announced that the British Government has let contracts to the value of nearly $27,000,000 (£5,400,000) for the manufacture of aircraft in Canada. The Canadian scheme for the production of Handley Page Hampdens is organised under Canadian Associated Aircraft, Ltd., and details of it were given in *Flight* for February 8 on page 137.

Fire in the Air

FROM Australia comes a story of cool piloting in a dangerous emergency. Captain Croucher was flying an Australian National Airways Douglas—probably a DC 2—between Melbourne and Adelaide on the one-day Melbourne-Perth run. When near Dimboola, and at an altitude of 6,000 ft., a bump was felt and the starboard engine stopped. Informing the ground station by radio, the pilot set out for the nearest emergency landing ground at Nhill, but within a few minutes the engine had caught fire.

By this time the aeroplane was being watched by people on the ground and, following it in their motor cars, they saw it side slipped skilfully to keep the flames away from the cabin and the wing tanks. When about to make a landing and only 100ft. above the ground, the watchers were amazed to see the engine fall out. But even this did not deter the pilot who, avoiding some trees, landed the aeroplane, and after conclusions with a fence, came to rest. No one was hurt, and the chemical extinguisher checked the flames. The whole incident reflects great credit on Captain Croucher for getting his passengers and aeroplane out of an exceedingly dangerous situation without casualties or major damage.

Aircraft Construction in Australia

IT has been announced that the Commonwealth Government will spend £25,000,000 on aircraft construction within the next two and a half years, largely to provide machines for the Empire Air Training Scheme. The announcement states that something like 3,000 aircraft will be needed for the scheme, about 1,000 of the bigger types of which, such as Fairey Battles and Avro Ansons, will be provided by the British Government. As has already been stated in *Flight* the earlier part of the flying training will be done on Tiger Moths and Wirraways which will be manufactured in Australia. The Bristol Beaufort is another type which will be made in the Dominion, but is, of course, not intended for training.

Help for Finland

A REPORT has appeared in the Norwegian paper *Aftenposten* that Finland is to receive 700 aircraft from abroad. It is stated that the Western Powers are to send 400 and Italy 100. A Spanish contribution of war material to the value of 5,000,000 kroner is also reported, but no indication is given as to the source of the remainder of the aircraft. (At the present rate of exchange of 17.70 kroner to £1, 5,000,000 kroner is equal to over £280,000.) There is no confirmation of this report.

The Finnish Consulate in Toronto announces that twenty Canadian airmen are leaving there to go to Finland. Judging by latest reports of the fighting in Finland, help is urgently required if Russian aggression is to be prevented from trampling down the boundaries of this gallant little democracy.

COMMERCIAL AVIATION

A BELGIAN CONTRAST: While British commercial aviation is being throttled, neutral countries forge ahead. This scene shows the re-opening of the SABENA service to Belgian Congo from Brussels. The aeroplanes are Savoia-Marchetti SM. 83s.

IN HEAVEN'S NAME, WHY?

"A. Viator" Cannot Understand Why British Civil Aviation Should be Left Behind

I SEE that the very genuine grievances of British civil aviation are being ventilated at last in various newspapers. When war started, certain brass-hatted eggs of mature age and curious flavour did everything to abolish civil aviation, both British and neutral. The neutrals—Dutch, Belgians, Danes, and Swedes—refused to be intimidated, and asserted the immemorial right of merchant vessels, flying neutral flags, to keep the high seas or the high airs.

So, after a bit of a battle, it was agreed that neutral commercial aviation should continue to fly from neutral countries to "somewhere in England." British civil aircraft, however, were permitted to do very little, and air routes which were really important, and even essential, could not be flown. Civil machines were camouflaged and kept hanging about doing nothing for months at a time in case some General desired to send a bouquet of flowers to the girl friend in France.

When this urge overtook the old man, a positively beautiful A.D.C., complete with bunch of roses, would proceed to Paris or thereabouts in an "Ensign" with a crew of five or six, including a steward skilled in the concoction of "Pansy's Dream" or "Pick-me-up-Cissie," or whatever the modern A.D.C. drinks in the way of a cocktail instead of an honest-to-goodness noggin of Army rum.

It is true that some air liners of the old Imperial Airways or British Airways fleet were occasionally earmarked for highly important military duties, such as carrying urgent stores to the B.E.F., viz., goal-posts for the troops or a mixed cargo of champagne, lambs' wool, bed socks, and copies of "How to Win the War in Twenty Lessons," with sub-title, "Success Guaranteed or Money Returned."

Frequently, air liners, which cost a devil of a lot of money, would be tethered in the open, festooned with twigs and branches, many of which thrust out roots as time went on, thus tying the engines into inextricable knots. All this was most gratifying to the anti-civil-aviation brass-hats, and it is doubtful if there would ever have been any internal air routes unless it had been represented to the proper authorities in glowing terms that there was an island off our coasts where the hard-worked staff, travelling at greatly reduced rates, if not free, could get a bottle of what set grandma galloping down the main street in roars of laughter and her *negligée*, for about 4s.

There appears to be no real reason why a number of British civil aircraft should not be made free from all this official joy-riding and from certain military tasks best undertaken by our huge surplus production of bombers. Neutral companies naturally wish to expand their network of airlines, and they would welcome British air lines running in conjunction with their own, just as, being neutrals, they welcome any expansion of German civil aviation.

Nothing could be more important to future communication between various countries than air transport, and the period immediately after this war will clearly demonstrate that fact, just about the same time as the hard-boiled eggs in brass hats who have striven to hinder it are being buried with full military honours accompanied by a considerable shortage of tears.

The French, who are realists, have abandoned their isolationist atttitude to some extent, I believe, and it is rumoured that both K.L.M. and Sabena may be allowed to land at Marseilles. This will be a considerable step in the right direction, both for the Sabena Congo line and for the

K.L.M. far-eastern route, which at present finishes flying at Naples.

There are rumours of a K.L.M. Amsterdam-Lisbon line, and of an Amsterdam-Dieppe line. Most neutral air transport companies are already discussing extended summer services to and from England.

This summer a line to England is to be run, I believe, by the Swedish company A.B.A., and thus everywhere civil aviation is booming so far as war circumstances permit. Great Britain alone appears, on the face of it, liable to be left behind. In Heaven's name, why?

It would appear to me to be vitally important for the Directorate of Civil Aviation to insist that commercial merchantment under its ægis should have the same facilities as the Board of Trade insists upon for merchant vessels of British nationality on the seas. After all, the Admiralty cannot collar a large number of merchant ships, stock them with gin and keep them hanging around in harbour in case some gallant old admiral desires to send his compliments to a wife in any or every port—except, possibly, Hamburg.

Anyway, nobody can blame the neutral companies for getting a move on, and no obstacles should be put in their way if civil aviation is to survive. Let British civil aviation, as represented by the Civil Air Ministry, take (a) a pull at its down-at-heel socks; (b) time by the forelock; and (c) the bull by its (brass-hatted) horns, and insist on the vital importance of British air lines taking their fair (if not the lion's) share. Let it never be forgotten that whilst this may be the moment when destructive aviation is in the ascendant, peace will bring constructive aviation into its own again.

That civil aviation is no longer the puny rival which shipping kings made a mockery of over their aperitif of "aurum potabile" a score of years ago seems to be proved by news of a new Dutch syndicate, composed of the Holland-America line, K.L.M., the Fokker Works and the Dutch Government, which, according to reports in the newspapers, has been formed with the intention of operating transatlantic air lines.

Somebody wrote to the newspapers recently extolling, lauding and magnifying the railway companies for their stout work during the late extremely trying weather conditions, and nobody could be more grateful than I was to a railway company which did ultimately get me to my destination alive, albeit several days late. Nor have I anything but admiration for the jolly system whereby the railway companies delicately hint to travellers during the black-out that quite possibly they may have reached their destination. This frequently takes the form of some invisible lost soul, apparently bitten "a tergo" by the stationmaster's dog, who lets out a wholly inarticulate scream of anguish, said to indicate the name of the place at which one has arrived.

Often it isn't your station at all, but one you would not be seen dead on, a thing which almost happens to you anyway when you descend, by reason of the fact that you are at the tail end of a long train and your bit hasn't reached the platform. "C'est magnifique mais ce n'est pas la gare," as the visiting Frenchman remarked, as he plunged down a thirty-foot embankment, rolled across the road and in through the swing doors of the Railway Arms, at a place I'm not allowed to mention, but which was at least fifty miles from the spot he was making for.

Praise the railways by all means, but do not neglect to give honour where honour is due, and that is to the pilots and crews of commercial air liners, who keep up an amazing record of punctuality and regularity in most difficult circumstances. Think, too, of the ground staffs of air traffic companies who have to work in appalling conditions sometimes.

A. VIATOR.

Air Service Reduced

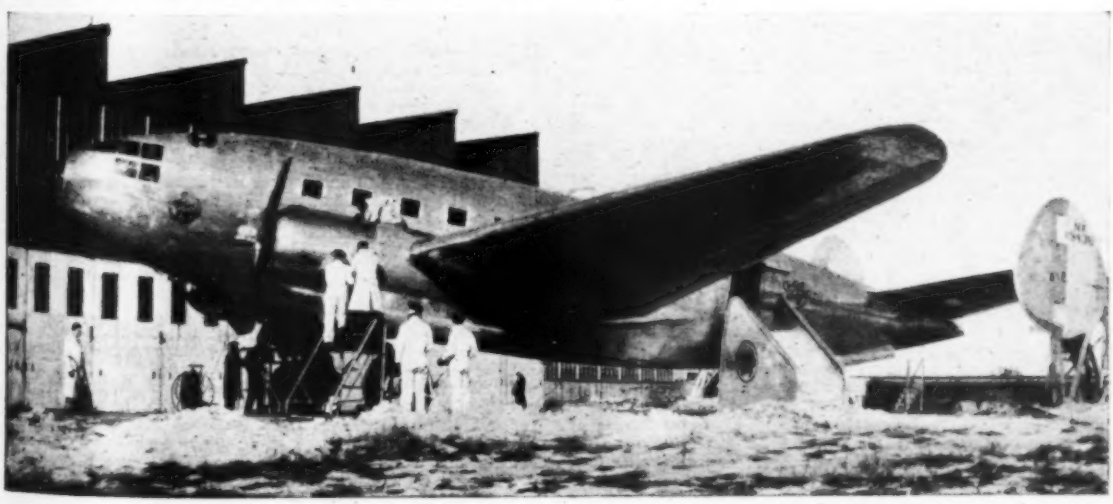
IMPERIAL AIRWAYS have found it impracticable to keep up the two services a week to Alexandria. In future only one, the landplane service, will be run. The reason for this reduction is lack of aeroplanes.

Distinguished Passengers

ON February 8 Lord and Lady Willingdon flew back to Sydney from New Zealand where they have been attending the centenary celebrations. The trip was made in the flying boat *Aotearoa*, "the long white cloud," which is the Maori name for New Zealand. Owing to head winds the flight was made at only 500ft. above the sea to avoid the westerly as much as possible. The crossing took seven hours.

Record Figures for A.B. Aerotransport

THE result for Swedish Air Lines (A.B. Aerotransport) for 1939 has, in spite of the war, been most satisfactory. 60,835 passengers have been carried as against 60,046 in 1938. Paying passenger-miles amount to 11,400,000 as against 8,800,000 last year, an increase of 30 per cent. The influence of the war can be measured by the fact that for the first eight months of 1939 the number of passenger-miles was up by 56 per cent. as against the same period for last year. Aircraft-miles flown amounted to 1,800,000 as against 1,690,000. Figures for freight and luggage have increased by a few per-cent. and amount to 1,130,000 lb. for the freight and 1,350,000 lb. for the luggage. Mails have decreased from 1,580,000 lb. to 1,270,000 as no night mail has been flown since September.



THE CURTISS-WRIGHT SUB-STRATOSPHERE MONOPLANE : This new machine, a description of which we published on January 11, is now almost ready for flight tests.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE BIOLOGY OF AIRCRAFT

A New Kind of Polygamy

MR. J. D. NORTH'S article in *Flight* of February 8 was of special interest to me, a biologist at present concerned with aviation. It is at all times difficult to decide where the organism stops and the environment begins. This difficulty is responsible for the shady character of the hermit crab. And yet, unless a boundary is defined, discussions like that initiated by Mr. North will remain nebulous. He extends the limit to contain the entire machine. In this generalisation important characteristics of living organisms are lost; such as healing up of wounds—unless the entire servicing organisation is included as well. Here, as in many other cases, the field of biological associations, like symbiosis, would prove, I think, more fertile.

I should like to point out, in connection with Mr. North's stimulating idea on the parentage of the plane that, from the point of view of the designer of the gun, it is the plane which is the cumbersome excrescence imposed by the male parent (the customer), who is, therefore, guilty of polygamy of a new kind: he begets from several wives one and the same defiant child!

J. COCHERNÉ.

Plymouth.

THE "VISUAL" LINK

A Life and Money Saver

IN your issue of February 1, 1940, you published some interesting pictures showing the new system of using the Link Trainer.

I think perhaps you would like to know who is responsible for the development and perfection of this scheme. It was Squadron-Leader N. Roy Harben, D.F.C., now in charge of the Training School at Derby Airport, who, by his practical genius, perfected the system of training now in use by the R.A.F.

It is a remarkable thing that the Link Trainer not only saves the country enormous sums in cost of flying training and petrol consumption, etc., but also saves a great many crashes and lives of young trainees, and in the end produces a better and more efficient pilot.

It is still more remarkable that an American invention was first really made serious use of in Great Britain, due to the imagination and initiative of the authorities in the Air Ministry. It is interesting to know that all countries are following us in our use of this remarkable device. It is a fact that this country saves millions of pounds a year by its ever-increasing use.

P. F. M. FELLOWES, D.S.O.,
Air Commodore (Retired).

Aston Clinton.

CONVERTIBLE AIRCRAFT

"Flight's" Scheme Elaborated

THE Editorial in your issue of February 8 raised some interesting points. By designing commercial aircraft and adapting them to suit military purposes, we could have a valuable fleet ready for the restoration of peace. They could probably be changed to commercial aircraft in a very short time, a much shorter time than it would take to build from scratch. Some commercial types already exist, on the drawing board, in the factory or in the hangar, which could be very well adapted to suit the R.A.F., and would certainly be more suitable than certain foreign types, with their different metal gauges, screw threads, etc.

For instance, the Fairey F.C.1, which is lying dormant at the moment, could be introduced as what might be called a "Morale Destroyer" without a great deal of difficulty. Its duties would be to make flights over Germany at its service height to places such as Warsaw, Vienna and Berlin, descending to the necessary height to drop "Clergyman's Bombs," and climbing back to the sub-stratosphere. The moral effect should make the experiment worth while, provided such flights were carried out fairly often. As the F.C.1's operating height will be fairly high, there would be little danger of attack from either A.A. guns or fighter aircraft. Its only moment of danger would be in the descent to drop the leaflets.

For armament, a power turret atop and a "power bin" below, fairly far forward, and perhaps a fixed gun for the pilot, should suffice. As the undercarriage is of the nose-wheel type, the "dust bin" need not be retractable, in which case hinged fairings could be fitted. Supplementary fuel tanks might be carried in the cabin. The use of the F.C.1 for such duties as the aforementioned would release valuable types like the Wellington and the Whitley for work which they will, no doubt, be required to do in the next few months.

The Flamingo might be adapted for use as a Coastal Reconnaissance machine also, and would be a worthy successor to the Anson. The Coastal Command has a very small selection of types for operation from aerodromes. This small selection may, of course, be an advantage. Surely the Flamingo can be produced in almost as large quantities as the Hudson, as it was designed from the beginning for quantity production.

Types such as the Albatross or the Short 14/38 landplanes could be used, almost without any alteration whatever, for transport of troops, supplies, spares and for ambulance work.

Man perfected the aeroplane for carrying passengers and goods, not for dropping bombs and machine-gunning fishermen, and the sooner the whole world realises this the better for all concerned.

ROSS INGRAM.

Dundee.

"MOORE-BRAB'S." FIRST AEROPLANE

Further Comments by Sir Alliott Verdon-Roe

SO, after all, it transpires that Short Brothers did supply most of Moore-Brabazon's first machine, which consisted chiefly of 1¼in. diameter ash rod and canvas. Therefore, there was good reason for me to have "thought" that Short Brothers had built this machine. I surmised, in my last letter on this machine, that they were in no way responsible for the design and structural strength.

Likewise, it was quite excusable on my part to "believe" that Short No. 1 and No. 2 were made "under arrangement with Wright Brothers," in view of the fact that Rolls obtained No. 2 Certificate on a Short-Wright biplane, and that of the first five Certificates obtained on Short machines, four were called "Short-Wright" biplanes, Moore-Brabazon's being the only exception.

In the above circumstances, surely the attitude taken up by Oswald Short was quite unjustified. In any case, there was not the slightest intention to insinuate that Short Brothers were only capable of building aeroplanes from drawings supplied. I have from the early days looked upon their design and workmanship as being of the highest order, and nobody admires their latest products more than I do.

Neither in referring to Barnum's quotation was I suggesting that Oswald Short should be pleased to have publicity at any price. I was trying to introduce a little cheerfulness into a matter which I considered he was taking too seriously.

A. VERDON-ROE.

Hamble.

ESCORT FIGHTERS

Contra-props and Turrets

MUCH discussion in your columns has been caused by the article on escort fighters, and several of your correspondents have suggested that the contra-prop method of using two engines has great advantages over the more usual method of installing the engines in the wing. I agree, but would not the same apply to the ordinary type of fighter?

Mr. Barty, in his letter, said that far too many aircraft have a blind spot under the tail. This, he says, could be removed by putting a power-driven turret in the tail. I think this could also be done in the case of the two-seater fighter. The machine I have in mind would use two Merlins in tandem, driving contra-props. The covering over the pilot's cockpit would terminate in the turret for the gunner. Fixed guns for the pilot would be fitted, as I think this a better policy than no guns for the pilot, as in the case of the Defiant.

Such a machine would, I admit, be difficult to balance, but I do not think it would be an insurmountable difficulty.

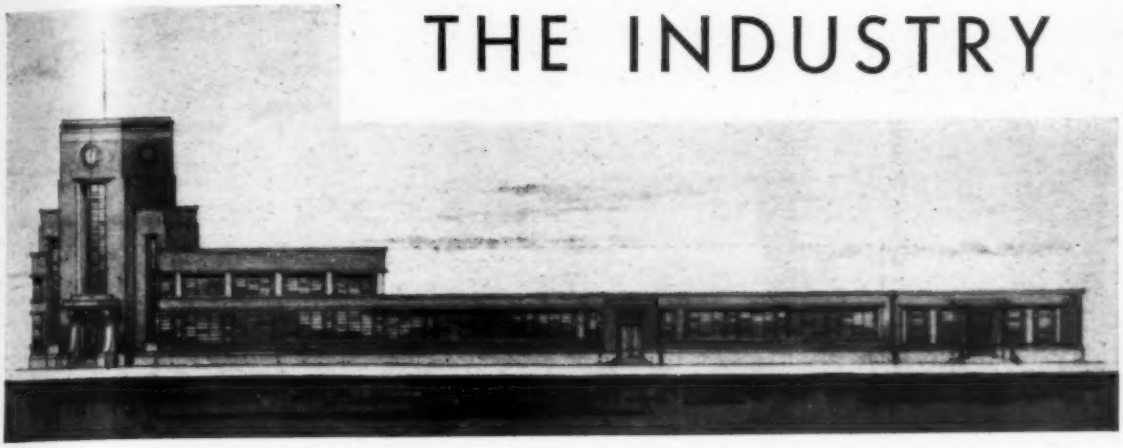
Either single or twin fins could be used, but as the turret would have to be close to the tailplanes a single fin would give a better field of fire. The great objection is that the tail turret considerably spoils the lines of the machine. But the extra power from the two engines should, according to my calculations, give a top speed of about 420 m.p.h.

The plan view of the fuselage would look rather like a much-scaled-down Wellington. Such a machine would be ugly to modern eyes, but the increased fire power should make the experiment well worth while.

"UNORTHODOX."

London, N.7.

THE INDUSTRY



When completed the new Opperman factory will be of modern pleasing appearance.

Stainless Steel Electrode

A NEW stainless steel, known as "Stainweld D," is announced by the Lincoln Electric Co., Ltd., Welwyn Garden City, Herts, to be used as the positive electrode for arc welding stainless steel of the 25 per cent. chromium, 20 per cent. nickel type. It can also be employed for welding various stainless steels to mild steel and for steels such as armour plate, which are air hardening and cannot be heat treated after welding.

"Stainweld D" electrodes may be had in five sizes ranging from $\frac{3}{32}$in. to $\frac{1}{4}$in.; are packed in 25lb. containers and are 11½in. in length irrespective of size.

New Opperman Factory

WORK has begun on the construction of a new factory for S. E. Opperman, Ltd., the aeronautical engineers to augment the company's existing works on the North Circular Road. Although the latter was built as recently as 1936 it has become too small for the increased activities of the company. The new works are being constructed on the most modern lines and will provide a considerable increase of floor space over the older building. An interesting feature of the frontage will be an historic clock constructed originally for the Great Exhibition held at the Crystal Palace. The clock, which has been kept in good order for nearly 90 years, was recently in the market as scrap metal, but was rescued by Mr. S. E. Opperman at the eleventh hour. Its face is made of copper and is some 5ft. in diameter; the pendulum weighs three-quarters of a hundredweight and the bell four and a half hundredweight.

The new factory is the latest development in the history of one of the oldest engineering families in this country. The origin of the various Opperman undertakings was a watch and clockmaking business started by Mr. C. Opperman, grandfather of the present managing director, in the middle of the last century. He did a big business in making and exporting watches to America until the Civil War put an end to this market. Apart from the aeronautical side of the business the company have built up a large business in reduction gears, geared motor units and agricultural implements.

Illuminated Magnifier

AS an aid to inspection of detail work the "Partington" illuminated magnifier gives in a single unit the advantages of the electric torch and magnifying lens.

The theory that has been followed is that the average reading distance from the eye is approximately ten inches and the actual area on which the eye concentrates at that distance is a circle of only 17 mm. diameter. Therefore a ×10 achromatic lens of 17 mm. diameter has been designed to give perfect focus ten inches from the eye and has been mounted on a ×2.5 lens of larger diameter to enable the observer to quickly locate his object. The magnifier assembly is of white bakelite and screws on to the handle which contains the battery and carries the bulb and reflector. The light produced is the colour of true daylight. For final focusing the lens is mounted in a quick thread, and it is easily removed for cleaning by taking out a rubber ring.

The whole apparatus is constructed in such a way as to be good enough for any purpose, however exacting, and yet enable minute examinations to be made by comparatively unskilled men.

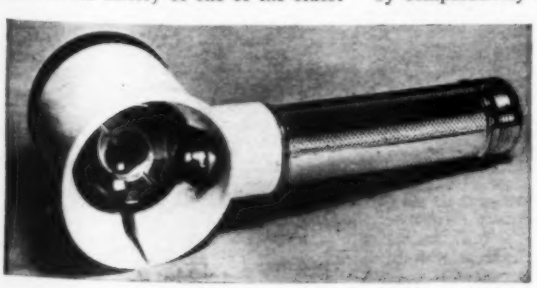
It is supplied in a strong teak box complete with transparent "Magnicometer" graduated in $\frac{1}{16}$in. and $\frac{1}{8}$in. squares and ruled from 1/55in. to 1/120in.

S. W. Partington, 96, Gloucester Road, London, S.W.7, are the makers. The price is £5 17s. 6d.

Aviation Developments, Ltd.

THERE has been some changes on the board of this company owing to Mr. David Orr, who was the financial sponsor of the company, taking a commission in His Majesty's service. His controlling interest has been sold to Mr. Stanley T. Johnson, the original founder and present managing director, and Mr. Orr's seat on the board has been taken by Mr. Joseph Shevlin.

Aviation Developments, Ltd., are responsible for the introduction to the British Empire of the well known Chobert system of riveting which originated in the Bleriot works in France. It was invented by Leo Kirste, an Austrian, who was at that time chief designer at the Bleriot concern and is now, unfortunately, in a concentration camp in Austria. It seems that the Chobert system has had almost a "corner" in aircraft pioneers, for not only did it have



(Left) Partington illuminated magnifier. The double lens, white bakelite reflector and torch bulb are clearly shown.

(Right) Looking through the Partington magnifier, showing the two magnifications. (Actual size.)

Outsize in Timken taper-roller bearings.

such august beginnings but the first man to put up capital for the introduction to this country was none other than Sir Alliott Verdon-Roe.

The company is now operating either directly or through agents in the British Isles, Canada, Australia and South Africa, and it is probably true to say that 75 per cent. of the aircraft built in the British Empire employ Chobert rivets in some part of the structure.

The war has, of course, greatly increased the activity of the company and more modern, convenient and less vulnerable premises have been occupied at No. 7, Woodfield Road, Welwyn Garden City, Herts. Here in safer, pleasanter and more healthy surroundings, a much expanded staff is very busy.

Vickers News

AT a meeting of the board of Vickers, Limited, held on February 15, the undermentioned final dividends were declared: 2½ per cent. actual, less income tax, on the preferred 5 per cent. stock. 2½ per cent. actual, less income tax, on the 5 per cent. preference stock. 2½ per cent. actual, free of income tax up to 6s. in the £ on the cumulative preference stock; making in each case 5 per cent. for the year ended December 31, 1939. Payment will be made on March 21, 1940.

It was also announced that the Hon. R. H. Vivian Smith has been appointed a director of the company.

Catalin

IN view of the Air Ministry recommendation that plastics may be used for non-stressed parts, Catalin, Ltd., Waltham Abbey, Essex, have issued a booklet giving in some detail the characteristics of Catalin as well as suggested methods of operation in the workshop.

Catalin is a solid cast phenolic resin which can be supplied in the form of rods, sheets, tubes and special castings. It does not require any curing or seasoning, and only standard machinery, tools and manufacturing equipment is necessary for fabrication.

It is available in a variety of colours, transparent, translucent, or opaque, and also in a water-clear form called Catalin-Crystal. Among other virtues it is claimed that this synthetic is non-inflammable, odourless and tasteless; resistant to alcohol, oils and common acids; has a high dielectric and compressive strength, and absorbs practically no water. The specific gravity is 1.3 or 0.048 lb. per cubic inch.

Catalin, Ltd., will be glad to help manufacturers in any way possible to overcome fabrication problems.

Timken Outsize

BRITISH TIMKEN, LTD., have recently manufactured some special tapered roller bearings for application to some large lathes built by Craven Brothers, Ltd., of Manchester.

In spite of the great dimensions of these bearings which are 81½in. by 67in. by 5½in., and the comparatively light section of the components, they are manufactured to the same high degree of accuracy attained by standard Timken bearings. This in itself is an eloquent testimonial to the quality of British craftmanship, especially in these days when we are only too prone to give other countries credit for qualities they do not always possess.

Highly specialised plant is required for the manufacture of tapered roller bearings of these large dimensions and considerable foresight was shown by the company in the installation of the necessary machinery some years ago in anticipations of the demand.

Aerodrome Drainage

ALTHOUGH, nowadays, the Censor asks us to refrain from referring to the weather this is still with us and rainfall will be much the same as it is in peacetime, and if too much arrives aerodromes will be rendered unfit owing to flooding. Be that as it may, investigation has shown that the average amount of surface water to be disposed of from aerodromes in temperate climates is in the nature of seven pints per second per acre. The condition of the surface is governed by whether this is carried away by near-surface drains or whether it is allowed to percolate to a deep drain and so render a strata, perhaps three feet deep, sodden and unstable. Obviously if near-surface drains are to be used they must be made considerably more robust than the usual earthenware pipes to withstand the impact loads of landing and taxying aircraft which tend to increase as time goes on.

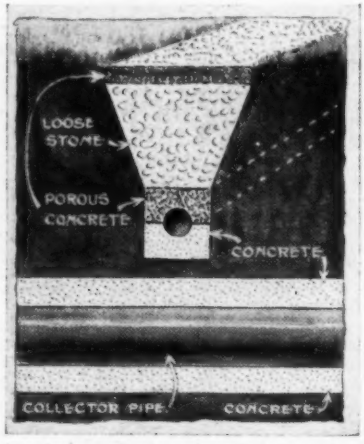


Diagram of Satujo jointless drain pipe, laid for special top surface as well as deeper drainage. The top 2in. of gravel can be cemented to prevent skidding of landing aircraft.

The Air Ministry has now given its approval of the Satujo method of drainage—a French system—which is being developed in this country by Halder Construction, Ltd., Harbrook, Ramsbury, Wilts. The process involves the casting *in situ* of cylindrical pipes, the upper half in highly pervious and the lower half in impervious concrete.

First, a trench is dug some 19in. deep and the impervious half is laid in and shaped to the desired half circle by a special tool to form the lower half of the pipe. Next, along this half pipe is laid a length (usually 70 yards) of rubber tube which is then inflated. Over this is poured highly porous concrete, containing no sand, to form the upper and pervious half of the pipe. After setting the moulding tube is deflated and withdrawn, leaving a jointless pipe. The remainder of the trench is then filled in with gravel and returfed. These porous pipes are generally of 3in. internal diameter and serve as primary drains to a system of larger collector pipes which may, of course, be laid as deep as is necessary to maintain the desired off flow of water.

The Halder Construction Company is prepared to advise on drainage problems and give any technical assistance which may be required.

Napier Balance Sheet

FOR the year ending September 30, 1939, D. Napier and Son, Ltd., report a trading profit of £158,079, which, with the balance brought forward from the previous account makes a total of £200,929. Dividends on the 7½ per cent. cumulative preference shares and 8 per cent. non-cumulative preference shares absorbs £37,060, and the directors recommend a dividend of 7½ per cent., less tax (which will require a further £26,618). The balance to be carried forward to the current year's accounts is £137,251.

Slow Motion

IN describing the "Fesa" welding apparatus in our issue dated February 8 we inadvertently gave the maximum welding speed as 2½in. per minute, this, of course, should have read 27½in. per minute. It is particularly unfortunate that the figure 7 should have been left out because speed of operation is one of the major claims for this apparatus.

AERONAUTICAL PATENT SPECIFICATIONS

(Published February 9, 1940.)

1938

13866. LANGLEY, T. W., and TECALEMIT, LTD. Instrument for indicating the attitude and behaviour of aircraft in flight (517,563).

16154. HARLEY, F. B. Means for varying the angle of incidence of aeroplane wings. (517,419).

17628. SHORT BROS. (ROCHESTER & BEDFORD), LTD., and MATTOCKS, A. O. Hulls of flying or motor boats. (517,515).

21362 WESTLAND AIRCRAFT, LTD., and PETTER, W. E. W. Aircraft (517,422).

22320. MASCHINENFABRIK AUGSBURGNURNBERG AKT.-GES. Diesel engines (517,432).

22679. SHEVLIN, J. T. (SIEMENS APPARATE UND MASCHINEN GES.). Electrical compasses for air or other craft. (517,551).

22686. MARCONI'S WIRELESS TELEGRAPH CO., LTD., and COCKERELL, C. S. Radio direction-finding receivers. (517,580).

22720. HOLT, C. F. Horizontal-keeping tables or platforms for instruments, artillery, and the like, for use in moving vehicles, including aircraft and watercraft. (517,554).

22768. ASKANIA-WERKE AKT.-GES. Gyroscopic instruments (517,587).